PUBLIC WORKS

CITY COUNTY STATE

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CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 52 FEBRUARY 18, 1922 No. 7

Paving by City Forces

By H. J. Hanmer, City Engineer

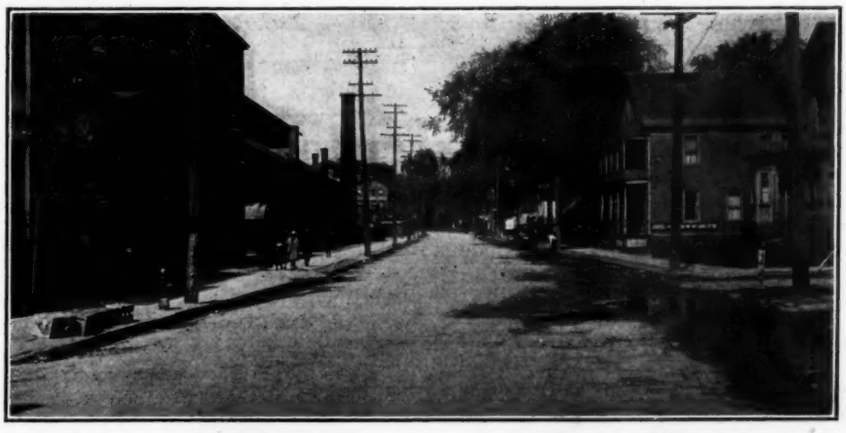
A reinforced concrete surface laid on an old concrete base at a cost fourteen per cent less than the lowest bid.

During the late summer of 1921 a portion of West Fulton St., Gloversville, N. Y., was repaved with reinforced concrete approximately 5½ inches in thickness. This portion of the street had been paved with cedar block on sand foundation in the year 1890 at a cost of $1.03 per square yard and repaved in 1901 with Park vitrified brick on 6-inch concrete foundation at a cost of $1.985 per square yard.

This portion of West Fulton St., which lies just west of the railroad crossing of the Fonda, Johnstown and Gloversville Railroad Co., is subject to very heavy traffic, being the only outlet to the west from the freight house.

On April 19th, 1921, bids were received upon this work with the intention of removing the old brick surface and sand cushion and placing on top of the old concrete base a 5½-inch surface of concrete, reinforced with steel weighing 32 lbs. per 100 square feet.

After the bids had been tabulated, however, it was deemed for the best interest of the city that all bids should be rejected and the work done by city labor



BRICK PAVEMENT IN GLOVERSVILLE, N. Y., AFTER CARRYING HEAVY FREIGHT STATION TRAFFIC FOR TWENTY YEARS

Comparison Between Lowest Bid and Cost by City Forces

		Quantities used		Unit price bid by contractor	Unit price by city	Contractor's total	City's total
1.	Removing old brick and sand cushion	2,235.55	sq. yds.	0.25	0.227	$558.89	$496.60
2.	Portland cement	610.00	bbls.	3.50	2.97	2,135.00	1.812.86
3.	First class concrete for pavement	344.52	cu. yds.	7.90	6.59	2,721.71	2,271.00
4.	Metal reinforcement furnished and placed	22,160.00	sq. ft.	0.0175	0.0159	387.80	353.40
5.	Setting and resetting curb in concrete	52.00	lin. ft.	0.65	1.14	33.80	59.37
6.	Furnishing new concrete curb	3.20	lin. ft.	0.45	0.37	1.44	1.20
7.	Furnishing new circular granite curb	48.80	lin. ft.	3.00	3 00	146.40	146.40
8.	Furnishing new concrete driveway turns	2	each	1.25	1.00	2.50	2.00
9.	Setting stone headers (furnished by city)	24.80	lin. ft.	0.65	0.474	16.12	11.75
10.	Furnishing and placing extra concrete (including cement)	14.28	cu. yds.	14.50	12.02	207.06	171.65
						$6,210.72	$5,326.23

under the direction of the city engineer. On the 8th day of September the first bricks were removed from the old pavement and on the 16th day of September the last of the concrete was placed in the pavement.

The above table shows a comparison of prices bid by the lowest bidder as against the actual costs of the different items of work as done by the city, and also the total cost of the work done by the city compared with what the total cost would have been had the work been done by the lowest bidder:

From the above table it will be noted that the total cost of the work as done by the city was $5,326.23, and the total cost of the work, if the contract had been awarded, would have been $6,210.72. This shows a saving of $884.49 or 14.2 per cent.

Treating Wood Block with Asphaltic Road Oil

By A. D. Stivers*

The city of Fort Worth, Texas, in common with other cities in the country, has had trouble with old wood block pavements. Main street, from Weatherford street to East Front street, was paved with creosoted wood block in 1916; and Houston street, from Weatherford street to East Front street was paved with the same material in 1913. These streets are in the main retail business streets of the city and carry a heavy, dense traffic. Each is 4,400 feet long and 56 feet wide between curbs, with a double-track street car line.

For the past two or three years these streets have given a great deal of trouble due to the expansion of the blocks from the absorption of water. This trouble, of course, has been confined to wet weather and has been so serious, on Houston street in particular, that the street has been almost impassable after a long period of rainy weather. Hummocks have formed several yards in diameter and 12 inches in height, which in some instances blew up and in others were broken through by passing traffic, so that some of the blocks would be destroyed or washed away.

In August, 1921, D. L. Lewis, city engineer of Fort Worth, taking advantage of the fact that practically no rain had fallen for two months and the blocks were thoroughly dry, repaired all bad places in the streets and treated the surfaces with asphaltic road oil. New blocks were used to repair places where the old blocks were crushed, and portions were relaid where the pavement surface was rough due to repeated expansions and contractions.

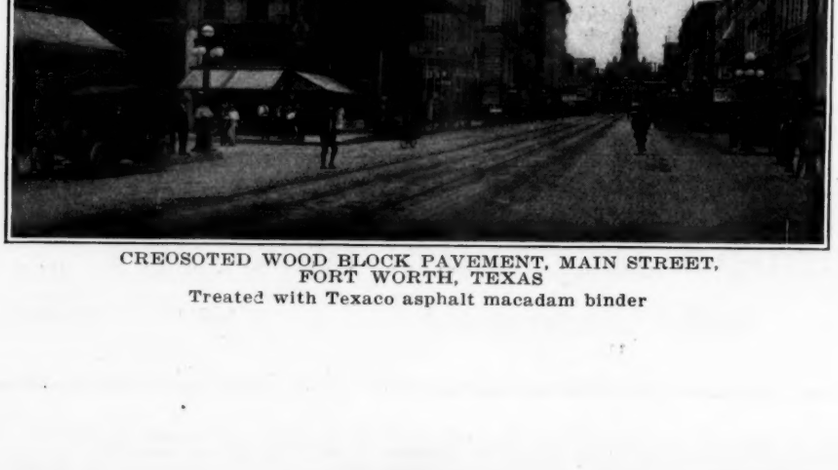
An expansion joint 1 1/2 inches wide was constructed along each curb and extended on a line with the face of the curb across intersecting streets. This joint was formed by cutting out portions of the old blocks and was filled with 50 per cent. of Texaco No. 39 Paving Filler and 50 per cent. coarse sand As soon as the general repairs and expansion joints had been completed the street was swept clean and treated with Texaco Special Macadam Binder, containing 75 per cent. of asphalt, at the rate of 0.2 gallon per square yard of surface. This material was applied with a Good Roads pressure distributor at a temperature of about 220 degrees F. The surface was then immediately covered with coarse sand, one cubic yard being used to cover 120 square yards, and traffic immediately turned over the street.

All work was done between midnight and 6:00 a. m., one-half of the street being treated at a time so as to cause as little inconvenience as possible to traffic. The treatment of both streets was completed in three nights, only three hours being required on the third night to complete the job. There was practically no interruption of traffic during the whole operation. Both repairs and treatment of surface were done by J. F. Wills, general contractor, of Fort Worth.

The space between the tracks of the street railway company was treated by them in a somewhat similar manner, the asphalt being poured by hand and covered with fine limestone chips instead of with sand. At the present time that portion of the surface covered with sand has a better appearance than that covered with limestone chips. This is due in part to the fact that there is much less traffic between the rails to iron out the surface.

Up to the time that this article is written, four months after the completion of the work, the treatment has been a complete success. There have been several rains during this period, but the blocks have shown no tendency to swell or buckle. The treatment seems to adhere perfectly to the blocks, and to seal them so that no water is absorbed or permitted to filter down between the blocks into the sand cushion. The surface has somewhat the appearance of a sheet asphalt pavement.

*Engineer, Asphalt Sales Department, The Texas Company.



CREOSOTED WOOD BLOCK PAVEMENT, MAIN STREET, FORT WORTH, TEXAS
Treated with Texaco asphalt macadam binder

Rolled Bases for Brick Pavements

By Stanley A. Knisely*

Return to this type of base, but built with more intelligent purpose than twenty-five years ago, encouraged by investigations and reports of Federal Bureaus and others.

Increased interest in and use of the rolled base for brick pavements is due principally to three causes; first, the continued good behavior of this type as year after year brings added age and heavier traffic burdens without their failing, as had been predicted by some; second, to new knowledge of the action of capillarity as expressed in part by the recent report of the sub-grade committee of the late Federal Highway Council; and third, to the recent survey of this type conducted by the engineering staff of the United States Bureau of Public Roads with its subsequent favorable report.

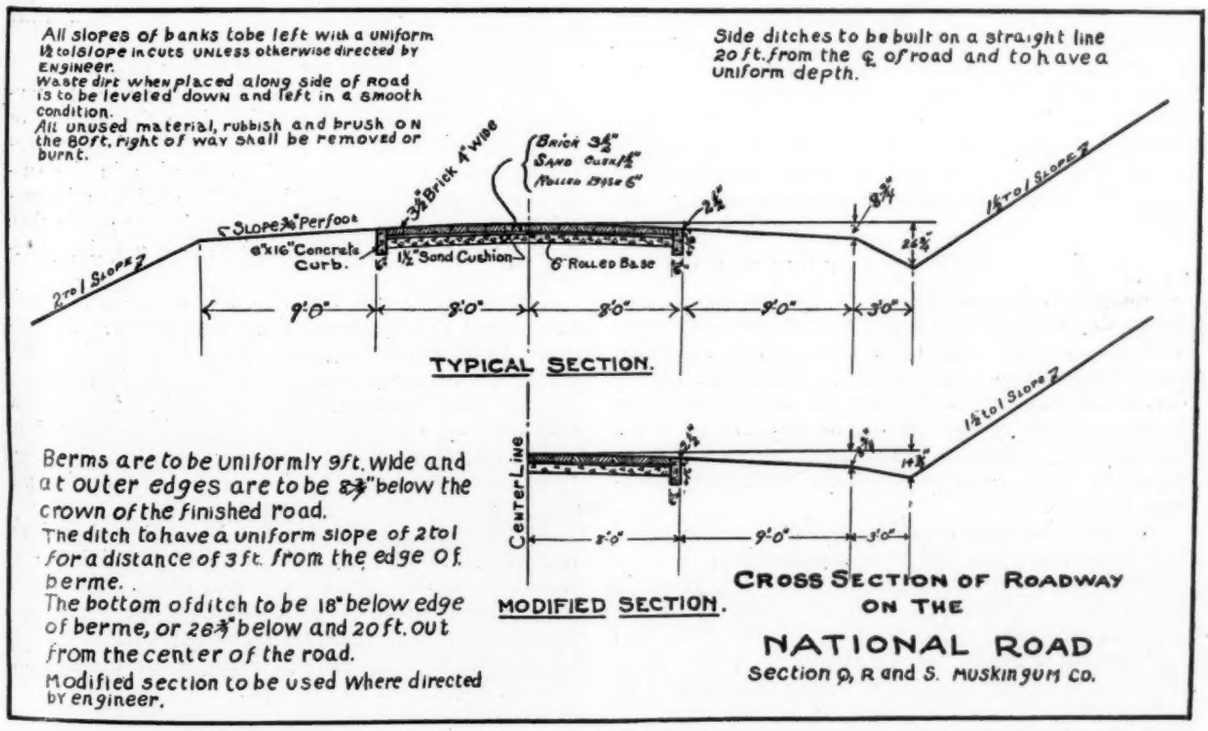
Rolled gravel, slag or crushed stone, spread in one or more courses, thoroughly compacted and bound with screenings, describes the rolled base in question. Its thickness is determined by the nature of the traffic it will be required to accommodate. Not more than 6 inches, with one inch of cushion, is customary on medium-traffic roads. Eight inches with an inch of cushion has been used successfully on the heaviest-traffic trunk lines.

In localities where gravel, slag or crushed stone is readily available there are instances where the rolled base has given satisfactory service under brick surfaces for as long as 25 years. The availability and low cost of the material probably figured largely in the choice of this base material in its earlier uses. Today, however, with highway engineers paying more and more attention to drainage and studying the action of capillarity as it affects various pavement types, the rolled base is adopted out of other and more important considerations than low cost.

As to the behavior of rolled bases under brick surfaces, the survey of the Bureau of Public Roads (conducted in Ohio because within the limits of that state were to be found the diverse soil, drainage and traffic conditions common to most parts of the country) covered rolled bases which had served up to ten years. This report, in its conclusions, finds the rolled base very satisfactory, and these conclusions are identical with those reached by highway engineers in many counties throughout Ohio and neighboring states who have been using the rolled base. As stated in the beginning of this article, the behavior of the rolled base, particularly on roads which never were designed to support the exceedingly heavy traffic which they are forced to accommodate today, is one of the arguments in its favor.

In the consideration of the action of capillarity, the report of Messrs. Charles M. Upham, A. T. Goldbeck, W. P. Blair and H. G. Shirely, who compose a special committee on sub-grade to continue

*Economist, National Paving Brick Manufacturers' Association.



CROSS-SECTION OF NATIONAL ROAD, SHOWING A BRICK PAVEMENT LAID ON A SIX-INCH ROLLED BASE

this phase of work started by the Federal Highway Council, contains this definite conclusion:

SOME HIGHWAY ENGINEERS' OPINIONS

"The committee wishes to call attention to the fact that interposing a layer of coarse material between the sub-grade and the surface will greatly retard the water or moisture from passing through or above such layer by capillary action, and it is the opinion of your committee that over all clays and adobe soils a layer of some kind of coarse material such as gravel, cinders, rotten rock, slag or stone should be used where the cost would not be unreasonably excessive."

F. H. Eno, Director of Research of the Ohio Good Roads Federation, in the federation's First Annual Report on Survey of Road Failures, just off the press, has this to say:

"Until research has revealed a more economical and satisfactory method of treatment, the following is recommended for trial. It is suggested as the result of some successful work done by the writer in paving a street over a swamp in Winnetka, Illinois in 1896. Excavate the sub-grade of the road, over all places where dense clay is encountered, 4 to 6 inches deeper than called for in the specified foundation. Fill this extra depth of sub-grade with clean gravel or graded broken stone. Be careful to bind the top portion of the porous course with sand or a clean binder that will permit the flow of water, but will not allow the concrete mortar (in this case a concrete base was used) to settle into the material and interfere with the drainage."

In brief, highway engineers who favor the rolled base for brick pavements, do so in the belief that the coarse material will at least greatly retard capillary action, keep the moisture level lower down in the sub-grade, keep the sub-grade more stable, cut down to a minimum the forces of expansion due to freezing and saturation of the base immediately under the surface, and finally provide a permanently substantial, yet flexible, support for the surface.

At the same time, the modern practice in the case of brick surfaces on rolled bases, is to use asphalt filler. The base, being flexible, calls for a flexible surface that will come and go with the forces of expansion and contraction, without cracking and upheaving.

POLICY OF BUREAU OF PUBLIC ROADS

This report of the Bureau of Public Roads may presumably be regarded in the nature of a statement of future policy. Up until this survey of rolled bases, the bureau had endorsed the rigid base. Therefore, the conclusion reached by the engineers of the bureau in their report on the survey are of more than ordinary interest. These conclusions follow in respect to those roads in which the Federal Government is interested.

"In summing up, a study of these roads would seem to warrant the following conclusions:

"That the rolled-base type, provided it is properly placed and compacted, is a suitable type for brick construction where soil conditions are favorable and good natural drainage may be obtained. Under these conditions a 6-inch compacted rolled base should be adequate, provided a 2-inch sand or screenings cushion is used.

"That the rolled base may be successfully used under ordinary road conditions, provided the thickness of the base is adjusted to meet the probable traffic requirements. An 8-inch to 10-inch compacted base, with an additional 2 inches of cushion should suffice under all but trunkline highways subjected to very heavy traffic.

"That whenever a rolled base is used, a bituminous rather than a grout filler should be employed in order to provide a flexible section throughout.

"That, in general, asphalt fillers are more satisfactory than tar or tar mastic fillers, owing to the tendency of the latter either to chip out or flow in hot weather, leaving the edges of the brick unprotected.

"That very inferior material, as measured by laboratory tests, may be successfully used as base material for brick roads."

FOR CITY STREETS

Use of the rolled base for city streets as well as rural highways is increasing. A stretch of the Lincoln Highway through the Borough of Wilkinsburg, Pennsylvania, was paved with brick on a rolled slag base last summer. Three-inch brick were laid flat and asphalt filler was used. The city of Warren, Ohio, has adopted the rolled slag base almost exclusively for city streets. Albert C. Smith, C. E. of the Smith Engineering & Construction Company of Warren, in writing recently about Warren's paving policy, says:

"We favor the rolled slag base because if thoroughly compacted it makes just as durable, firm and substantial a base as I know of; is elastic under climatic changes; is cheaper than some; furnishes a means of drainage in addition to the drainage behind the curbs and thus retards capillary action, and permits extending the paving season into cooler weather because there is no danger from freezing."

As to asphalt filler, the same writer says:

"We favor using asphalt filler because it stays where it is put without running into the gutters or being carried away on the automobile tires, allows for sufficient expansion and contraction in the surface, adheres well to the joints of the brick and keeps out water, is obtainable today in a better grade than in the past, and assists in providing a quiet pavement."

The rolled base is not a new idea by far. Engineers used it a quarter of a century ago. Significance, however, centers around the fact that highway research is revealing reasons for the rolled base which are directing renewed attention to it. Not a few engineers who once used it and then abandoned it, not because it failed but because they thought something better was offered, are returning to this base material.

The Bureau of Public Roads report, therefore, formally introduces the rolled base type into the family of paving brick types and gives it a definite place among them. The field of design is not narrowed by any reflection on other types of bases, but is widened by the formal recognition of and increased interest in an old type.

Paving Euclid Avenue

Six miles of brick pavement on concrete base with stone curbs. Smooth surface secured by finishing machine with counterbalance tamper running on special track.

Euclid Avenue, in Euclid, Ohio, is paved for 3 miles with an 18-foot strip of brick pavement on each side of the center of the street (two parallel strips 20 feet apart), which is to be double tracked, thus making 6 miles of 18-foot pavement, which is being executed at a contract price of $460,000 by the Freshwater Construction Co., Cleveland, and by Baldwin Bros., in equal parts. The brick surface has a concrete base from 4 to 12 inches thick, reinforced with ¼-inch wire mesh and with two ½-inch bars at the edges. The alignment is nearly straight and level and the road is drained by one line of 4-inch tiles under the curbing on each side, and two lines of tiles in the center. The outer edge of each strip of brick pavement has a convex stone curb extending 6 inches below the grade of the inside form.

Part of the broken stone for the concrete base was produced by a local quarry and stored only on subgrade. The remainder of the stone and the sand were delivered at a point about one-half mile from the center of the job where cement also was unloaded from cars on an adjacent siding. Both cement and aggregate were delivered by Mack and White trucks to the 21-E Foote mixer, that was served by a Koehring loader, and supplied with water from the city service. Sometimes as many as 15 trucks were occupied in delivering cement and aggregate. The brick was delivered by five flat top Packard trucks hauling it almost continuously as fast as space could be cleared for the bricks to be piled. Difficulty was experienced in delivering materials on the south side of the street on account of the necessity of dumping them over the suburban car tracks.

At first there was trouble in securing a smooth surface of the brick pavement, but as the stone curb did not offer satisfactory support, it was impossible to use a finishing machine until the contractor's engineer devised for it a special track on top of the curb and also designed a special counter weighted tamper, both of which were entirely satisfactory from the outset.

FINISHING MACHINE WITH COUNTERWEIGHTED TAMPER

CURB TRACK FOR TAMPING MACHINE

The use of the finishing machine enabled the contractor to dispense with considerable labor of the pick-up. Although the presence of the machine in the rear of the brick droppers had a stimulating effect upon them, the best effort did not enable them to keep up with the full capacity of the machine although an average progress of about 500 feet per day was achieved. The brick droppers were always kept within 40 feet of the concrete mixer, which at no time was pushed to its capacity.

Preliminary work was commenced in June last and construction was suspended on November 1st after the completion of about 4 miles of pavement, leaving 2 miles that will be finished in the spring.

The excavating, grading, paving, concreting, grouting and installation of drains required an average force of about 60 men for each contractor. Just before the work was suspended last fall the Freshwater Construction Co. laid 3,750 linear feet of 18-foot pavement with 6-inch concrete subbase and a 12 x 22-inch trench on each side in nine days of nine hours each.

Notes on "Cost of Local Materials"

The following items are supplementary to the table on page 128.

Ft. Lauderdale, Fla., reports the cost of cement as $4 net per bbl.

Ft. Myers, Fla., reports the cost of "dead oyster shells" as $1.50 per cu. yd.

In Ash'and, Ky., crushed slag cost $3.75 per cu. yd.; in Lackawanna, N. Y., $1.25 per cu. yd.; in Alliance, O., $2.70 per ton; in Cleveland, O., $3 per cu. yd.; in Lakewood O., $2.70 per ton; in Oberlin, O., $2.40 per ton; in Duquesne, Pa., $1.15 to $1.25 per ton on siding; in Oil City, Pa., $2.80 per cu. yd.; Fairmont, W. Va., $3.50 per ton.

In Du Bois Pa., crushed sandstone costs $2.25 per ton and crushed limestone $3.50.

In Pawtucket, R. I., local stone cost $2.75 per ton, but trap rock on street $3.65 per ton.

Economical Delay

It is reported that the contractors in Toledo saved the city $250.000 by a determined stand against extortion by the brick dealers and the bricklayers. The school board delayed their program until the contractors were ready to bid, and prices and wages became reasonable, and nobody suffered from injustice.

Pittsburg Test Highway*

By Charles W. Geiger

TEMPERATURE VARIATION IN THE SLAB

A series of holes were drilled in the various sections approximately 5/8 inch in diameter and filled to a depth of 1/2 to 3/4 inch with mercury for taking temperature of the slab (See description in issue of Dec. 10). The following table shows the typical situation for one day.

		Slab F, 5-6		Slab F, 6-7		Slab D, 6			Slab C, 1-2	
Time	Atmosphere	Bot.	Top	Bot.	Top	Bot.	Center	Top	Bot.	Top
8:05 a.m.	60°	55	52	58	53½	55	54	53½	56½	56
10:00 a.m.	65½°	56	60	59½	62	58	59½	62	59½	65
11:30 a.m.	73½°	58	68½	62	70	61½	65½	70	63½	73
1:00 p.m.	76°	61	73	64½	75	65½	70	75	68	78½
2:45 p.m.	78°	64½	74	68½	76	68½	72	75	70½	77½
4:35 p.m.	74½°	66½	69	69	71	69½	70	70	70½	71

EXTENSOMETER MEASUREMENTS OF STRAIN

An extensometer reading to 1/60,000 inch was specially constructed for use in these tests. (See p. 449, issue of December 10.) The following points brought out in these tests are of interest:

1. With extensometer placed in the center between the two rear wheels and in direction of the rear axle a movement in Slab B of 13 divisions (corresponding stress with E assumed 2,000,000 is 41 lbs. per sq. in.) of tension was noted.

2. With extensometer back of rear wheel as close as possible, the strain was 5 divisions of compression.

3. A line of points for extensometer measurements was set on a diagonal at a corner formed by the intersection of a construction joint with the edge of the slab. A rod was driven in order to measure vertical deflection with the Ames dial. In the late afternoon after a day of traffic, a truck was backed on to this section so that one rear wheel was at the corner, the other also on the slab the gauge length away. The extensometer and Ames dials were set and the truck moved off. This was repeated, getting readings between successive extensometer points. On the following morning the whole experiment was repeated. The following tells the story:

Point	Vert. Defl.	Strain Divisions	Time
1-2	...	22	5:15 p.m.
2-3	.028	12	.....
3-4	.028	9	.....
4-5	.027	11	.....
5-6	.027	5	.....
1-2	...	.31	7:30 a.m.
2-3	.067	.29	"
3-4	.068	.23	"
4-5	.066	.25	"
5-6	.066	.25	"

It will be noted that the vertical deflection in the morning was much greater than in the afternoon experiment. Also that the extensometer readings were greater and the cantilever action extended further along the diagonal line. The zone of support had apparently moved from a point approximately two feet from the corner to at least five feet. This was probably caused largely by the curl of the pavement due to temperature. Another interesting test, as the truck moved off of the slab under test on to the adjacent slab, but 10 per cent of the total deflection was lost. As the load was taken farther away the deflection decreased till at a distance of ten feet its effect was lost. In the morning measurement 90 per cent (approximately) of the deflection was lost in moving the wheel load just over the joint and on to the adjacent slab. The two slabs were separated by a one-half inch wooden header board. The relative atmospheric temperature was 65 degrees for the first test and 45 degrees for the second.

*Concluded from page 104

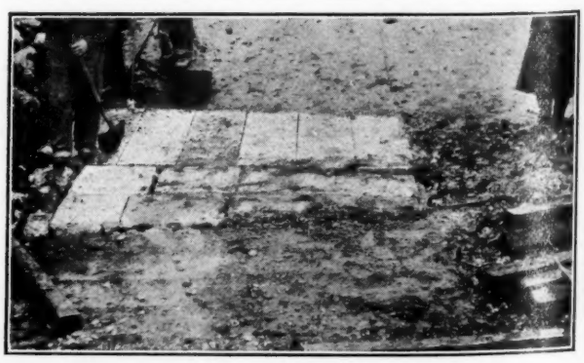
REPAIRING BREAK IN SECTION B WITH 12 BY 12 TIMBERS

LABORATORY TESTS ON THE SUBGRADE

Moisture content determinations have been run under all sections of the pavement from the period before the concrete was laid up to date.

At the request of the engineers representing the California Automobile Association, points were set spanning construction joints both transverse and longitudinal, as well as transverse cracks which opened after the pavement was poured. Holes were drilled in the pavement to a depth of approximately one inch; these filled with lead and marks for measurement scratched thereon. Readings were taken by means of a scale reading to 1/64 of an inch.

The first rainfall after the traffic tests were started occurred on November 21. By the following morning .42 inches of rain had fallen. Truck traffic was continued until noon of this day. It was very noticeable that the deflections of the pavement at the corners was less than on the previous day. This observation was checked by comparing the automatic graphs for November 22 against those of November 21, whereby it was found that there was approximately 60 per cent of that on November 21 for the same load. This is apparently due to the fact that the grade under the shoulder swelled with the first application of water and effected a better subgrade reaction in this zone.



REPAIRING BREAK IN SECTION H BY MEANS OF CONCRETE BLOCKS

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Paving Statistics for 1921

Paving activities last year took a long step toward pre-war conditions. Cities large and small in all sections of the country did considerable amounts of paving, using all of the standard materials. To name only three large cities, Los Angeles laid 620,000 square yards, Chicago laid 793,000 square yards, and New York City 2,120,000 square yards; the amount spent by these three cities for paving being $1,719,679, $3,266,600 and $9,386,160 respectively, or nearly 14½ million dollars by these three cities alone.

In response to questionnaires sent by us, paving officials of about seven hundred cities have sent figures and information concerning last year's paving and this year's prospects. In order to permit tabulation for this issue, we have used only the replies that had reached us several days ago, when 485 were on hand. Data from the remainder, including those that may still be received, will be tabulated and published in a later issue.

In addition to the figures for paving done, we obtained other valuable information which we will present in instalments in succeeding issues of PUBLIC WORKS. This includes descriptions of the methods used by the several cities in resurfacing old pavements; of changes made in design or specifications for the several kinds of pavement; and the methods of making assessments or raising in other ways the funds for payment for paving work.

This information will, we believe, be of great value to paving officials, as it furnishes facts relative to the amount of each class of pavement laid in every section of the country, the unit cost, the trend of development of methods in laying pavement and paying for it, and the probable amount of work that will be done in 1922.

Paving Prospects for 1922

More paving will be done by cities in 1922 than was done in 1921, and the cost, whether done by contract or by day labor, will be less.

This is already indicated by a number of conditions and by reports from various sources. Materials are lower in price, labor is decidedly lower in most sections, and freight rates on many materials have been reduced.

Last year was a good year for contractors, most of them making large profits because of the reduction of prices and wages after the signing of contracts, and those profits will naturally cause an increase in the number of contractors this year, which will tend to lower contract prices.

These are only indications, but they serve to strengthen more positive evidence pointing in the same direction. This evidence consists of the direct statements made to this paper by more than two hundred city engineers in all parts of the country as to what their cities were expecting to do in the way of paving. It is of course earlier in the year (unfortunately) than most cities decide upon their paving program, and about three hundred engineers preferred not to make any statement, while some of the two hundred reported only what was definitely decided upon. On the other hand, some cities had already contracted for the paving reported. These forecasts would seem therefore, to be as conservatively reliable as such things can be.

According to these, and accepting them as typical of the cities generally, the amount of paving done this year will exceed last year's total by about 40 per cent.

But this rate of increase will not be uniform throughout the country. It will be much greater in the South and much smaller in the North. The average of the cities in the South Atlantic states and that of those in the southern half of the Mississippi basin were, curiously, the same—85 per cent. Averaging all those west of the Rockies, we have a 60 per cent. increase indicated. In the northern half of the Mississippi basin the average is much less—only 13 per cent. In the middle Atlantic states only an 8 per cent. increase is reported. In New England the figures reported show an actual decrease, but the number of engineers there who were able or willing to forecast what their cities would do in the paving line was too small to form a reliable basis.

As suggested, it is probable that the 1922 forecast is conservative. As indicating the attitude of many of the engineers, one wrote: "The pavements indicated for 1922 are all that are assured. Five or six miles more is contemplated."

Altogether, it seems to us that the prospects for city paving are better this year than they have been for several years past.

Recent Legal Decisions

QUESTION OF ELEVATION IN CONSTRUCTION OF SIDEWALKS

In Houston Belt & Terminal Ry. Co. v. Scheppelman, 235 S. W. 206, an action against a railway company for injuries to a pedestrian by a sidewalk made defective by the railway's construction of a sewer under a permit from the city, the court said, though the question of original construction was only indirectly involved in the case: "In constructing sidewalks it becomes necessary in many instances, on account of the topography of the land, to deal with elevation. In such instances, the municipality may overcome the elevation in such manner as the judgment of the proper officials having charge of the highways may dictate, and its duty to the public is discharged, provided that ordinary care is exercised to make them reasonably safe for the purpose of travel. It often results that steps are used to overcome elevation, and that there is no uniformity insofar as evenness and equality of surface are concerned; but whether the required standard has been applied by the municipality in constructing them is generally a question for the jury's determination."

CITY NOT REQUIRED TO PROVIDE FOR DRAINAGE OF ABUTTING PROPERTY ON RAISING GRADE OF STREET

The Arizona Supreme Court holds, City of Globe v. Moreno, 202 Pac. 230, that a city which has done nothing more than raise the grade of a street in front of an abutting owner's property, is under no obligation to provide drains to protect from storm and flood waters the owner's property, which has been made lower than the level of the street.

FACTS INSUFFICIENT TO SHOW NEGLIGENCE OF CITY OR CONTRACTOR REPAVING STREET

In an action for personal injuries against a city and a construction company which had repaved a street under a contract with the city it appeared that the plaintiff, in the night-time, while walking to her home, came to the street while it was in process of being repaired. At or near the point where she entered the street, the contractor had placed a barricade across the repaved portion, and had stationed a watchman, who spoke to the plaintiff and told her not to walk in the street, but to stay on the sidewalk until she got to the alley, or crossing; then she could go out into the street. Before reaching the alley she started across the park strip to get into the street, and was injured by falling over some pieces of iron water pipe which the contractor had left lying lengthwise on the parking. The plaintiff claimed that the city and the contractor owed her the duty to give her warning of the presence of the water pipe, or to have placed lights thereon. The Kansas Supreme Court holds, Conley v. Kansas City, 202 Pac. 607, that these facts failed to show negligence on the part of the defendants. It is also held that an instruction to the jury limiting the city to the use of certain methods of precaution is misleading and erroneous, since the city is required to use only such means as are reasonably sufficient to warn pedestrians of the dangerous condition of the street. Judgment for the plaintiff was reversed, and judgment directed for the defendants.

TIME OF INJURY BY DEFECTIVE STREET OR BRIDGE MUST BE ADEQUATELY STATED

The Vermont Supreme Court holds, Southood v. Town of Cambridge, 115 Atl. 497, that a notice to a town of injuries caused by an alleged defective bridge, dated July 3, 1919, and stating that the injuries were received on Sunday, June 15th, without stating the year, did not comply with the statutory requirement that the time must be stated, since the selectmen are not supposed to enter upon a calendar reckoning to ascertain the time the injury was received.

STATE HIGHWAY CONTRACTOR, ON FAILURE OF STATE'S ASSURANCES TO HAVE CULVERT OVER RAVINE COMPLETED, NOT OBLIGED TO MAKE DETOUR

A state highway contractor, unable to continue work under his contract because a culvert over a ravine had not been constructed pursuant to his contract, was repeatedly assured by the state that the culvert would soon be in its place. In a claim by the contractor against the state for damages, the New York Court of Claims holds, J. W. Brennan Const. Co. v. State, 191 N. Y. Supp. 253, that the contractor was justified in keeping his steam shovel on the completed side of the ravine, in position to resume work when the culvert was completed, and was not obliged to assume that the state's assurances were worthless and to expend the considerable sum and effort required to make a detour to resume work on the other side of the ravine

RIGHT TO COMPENSATION FOR EXCAVATION BELOW SUBGRADE UNDER ROAD CONSTRUCTION CONTRACT

A contract for the construction of a concrete highway for a county provided for "all excavation of every description without classification including all incidental work for the price of 60c. per cubic yard." Oil was encountered and excavated below the finished subgrade. The county contended that "the removal of the oil cakes was work incidental to the grading." It is held, W. Gillivray Const. Co. v. Hoskins (Cal. App.) 202 Pac. 677, that the contract contemplated compensation for such excavation. The decision of the engineer that the contract did not provide for payment on account of excavation below the subgrade was not conclusive, notwithstanding a provision in the contract that the engineer's decision should be final on questions arising during the progress of the work as to what was required by the contract and in what manner it was to be done. When the contractor has followed the decision of the engineer and performed the contract in accordance with that decision, then, it is held, it becomes a question of law whether the former is entitled to compensation for any particular item of work done.

Paving Statistics for 1921

Facts and figures obtained direct from the paving officials of more than seven hundred municipalities give an excellent idea of the work done throughout the country last year. Only a part of the data from a part of the cities is given in this issue. The rest will follow in successive future issues

Table No. 1—City Paving Done in 1921

1—Sheet Asphalt and Asphalt Concrete

Name of City	Sheet Asphalt Area	Sheet Asphalt Cost	Asphalt Concrete Area	Asphalt Concrete Cost
Alabama:				
Bessemer	45,000	.....	....	.....
Fairfield	....	.....	2,929	$10,844.00[x]
Gadsden	....	.....	30,000	2.75[b]
Arkansas:				
Fayetteville	....	.....	10,000	3.00[b]
Little Rock	38,500	$1.80[e]	17,800	3.25[e]
Pine Bluff	40,000	3,000.00[e]	....	.....
California:				
Los Angeles	205,175	550,706.00[e]	24,737	84,111.00[e]
San Francisco	16,556	47,700.00[e]	172,971	404,748.00[e]
Vallejo	....	.....	2,900	.....
Colorado:				
Boulder	....	.....	100,000	3.75[a]
Connecticut:				
Hartford	83,278	70,931.82[e]	....	.....
New Britain	600	2.11	....	.....
New Haven	51,691	130,000.00[x]	....	.....
Illinois:				
Centralia	14,581	4.30[b]	....	.....
Chicago	584,137	3.28-3.91[a]	....	.....
Chicago Heights	....	.....	8,700.2	40,361.00[x]
East Moline	....	.....	10,110	54,925.00[x]
Joliet	....	.....	78,500	3.04[b]
La Grange	4,000	3.60[b]	7,000	2.10[b]
Ottawa	....	.....	13,313	3.11[b]
Peoria	22,955	1.90[e]	....	.....
Danville	20,000	2.47[e]	....	.....
Indiana:				
Elkhart	15,300	86,700.00	....	.....
Fort Wayne	92,153	457,213.08[x]	58,197	286,145.51[x]
Gary	34,652	1.60[e]	....	.....
La Porte	43,991.27	179,390.60	....	.....
South Bend	29,935	4.17[b]	44,997	3.60[b]
Iowa:				
Des Moines	65,920.16	216.063.53[e]	137,316.11	548,366.71[e]
Fort Dodge	....	.....	65,000	3.49[e]
Iowa City	15,000	3.72[b]	....	.....
Newton	....	.....	11,825	4.49[b]
Oskaloosa	....	.....	94,000	3.97
Kansas:				
Ottawa	17 blocks	.....	....	.....
Parsons	....	.....	20,500	25,513.65[b]
Topeka	....	.....	42,242.9	126,728.70
Wichita	15,980	2.84-3.85[b]	44,100	2.78-3.60[b]
Kentucky:				
Paris	20,000	100,000.00[b]	....	.....
Louisiana:				
New Orleans	7,088	26,807.00	....	.....
Maine:				
Portland	....	.....	6,043.67	22,575.30
Massachusetts:				
Lynn	....	.....	3,106	1.34[e]
Springfield	40,000	1.93[e]	....	.....
Michigan:				
Detroit	1,794,450	.....	19,250	.....
Grand Rapids	57,709	263,765.00[x]	....	.....
Highland Park	8,233.94	48,213.65[x]	6,958.49	37,844.37[x]
Midland	9.072.1	3.49	2,173.3	3.35
Niles	....	.....	13,000	3.20[b]
Minnesota:				
Minneapolis	....	.....	76,131	294,359[e]
St. Paul	80,071	216,905.00[x]	11,544	50,957.00[x]
Mississippi:				
Clarksdale	....	.....	11,000	3.75[b]
Greenwood	....	.....	40,000	3.97[b]
Missouri:				
Kansas City	280 mi.	193,260.00	.71 mi.	43,250.00
St. Louis	70,185	237,643.85	....	.....
Nebraska:				
Lincoln	10,627	3.10[e]	28,376	2.80[e]
Nebraska City	....	.....	28,000	2.65
Nevada:				
Reno	....	.....	102,300	204,903.00[e]
New Jersey:				
Bayonne	....	.....	29,767	.....
Fort Lee	15,193	2.75[e]	....	.....
Newark	54,248	4.00	....	.....
New York:				
Albany	9,543	$31,777.66[e]	16,946	$54,977.02[e]
Binghamton	....	.....	12,156	65,003.00[e]
Buffalo	243,651	1,081,581.76[x]	....	.....
Fulton	....	.....	8,260	2.85
Geneva	....	.....	15,000	3.50
Brooklyn Boro	600,000	3.89[e]	....	.....
Bronx Boro	1,912,960	2.57[e]	7,911	2.07[e]
Manhattan Boro	140,900	851,200[x]	612	3,100[x]
Queens Boro	80,000	150,000	45,000	95,000
Richmond Boro	....	.....	22,694	2.49[e]
Niagara Falls	8,093	45,495.15[x]	....	.....
Poughkeepsie	19,385	85,485.00[e]	....	.....
Rochester	264,422	3.15[b]	....	.....
Schenectady	....	.....	70,758	238,155.83[x]
Ohio:				
Akron	41,068	278,699.00	....	.....
Alliance	37,770.7	.32[b]	....	.....
Cleveland	88,370	240,300.00[x]	10,410	35,120.00[x]
Cuyahoga Falls	36,307	4.25-5.90[b]	....	.....
Fremont	10,067	56,127.00[x]	....	.....
Lakewood	6,500	3.50[b]	24,776	3.27[b]
Lancaster	9,135	38,909.50[x]	....	.....
Lima	1,879	7,400.00[x]	....	.....
Salem	....	.....	12,700	1.49[e]
Sandusky	27,751	3.24[b]	....	.....
Toledo	2,586	3.55[b]	5,264	4.36[b]
West Park	....	.....	14,540	82,796.00[x]
Oklahoma:				
Sapulpa	....	.....	7,450	35,773.00[x]
Oregon:				
Portland	....	.....	279,614	769,237.00
Salem	....	.....	8,081	23,092.00
Pennsylvania:				
Ashley	9,500	.....	....	.....
Beaver Falls	....	.....	17,000	4.15[b]
Chester	....	.....	7,190	3.49-3.53[e]
Oil City	28,020	1.70[e]	....	.....
Pittsburgh	146,000	3.75[b]	....	.....
Wilkes-Barre	19,231.18	79.128.75[x]	....	.....
York	23,950	3.65	....	.....
Rhode Island:				
Westerly	6,550	.95[b]	....	.....
South Carolina:				
Columbia	70,000	2.76[b]	....	.....
Spartanburg	4,270	.....	36,025	.....
Tennessee:				
Clarksville	....	.....	40,000	4.00[b]
Cleveland	30,117	88,844.00[b]	....	.....
Johnson City	....	.....	40,000	120,000.00[e]
Texas:				
Beaumont	5,870	4.60[e]	....	.....
Wichita Falls	....	.....	40,050	230,000.00
Virginia:				
Danville	23,140	25,155.25[e]	32,432	99,223.75[e]
Norfolk	56,866	120,520.00[e]	....	.....
Washington:				
Seattle	2,686	2.80[b]	....	.....
West Virginia:				
Parkersburg	14,500	2.30[e]	....	.....
Wisconsin:				
Appleton	29,837	3.96[e]	....	.....
Green Bay	9,200	3.75[b]	....	.....
Madison	24,390	3.10[b]	2,926	2.40[b]
Milwaukee	203,665	736,564.00[b]	....	.....

[a] Includes wearing surface only. [b] Includes wearing surface and base. [e] Includes wearing surface, base and grading. [x] Includes wearing surface, base, excavation and miscellaneous, such as curb, sewers, etc.

[a] Includes 8-in. base and two applications of sand-asphalt surface treatment [c] Includes 14-in. concrete base in car tracks. [d] Surface treated. [f] $4.25 per cu. yd. of crushed stone in place and 19 cts. per gal. for tar. [g] Scarifying and rolling old macadam, building up base and placing wearing surface. [h] Dressed and redressed granite. [j] Grading $1.25 per cu. yd.; curbing $1.25 per ft.; paving includes 10-in. granulated slag, brick and asphalt filler $3.00 per sq. yd. [k] Of this total, 2,500 sq. yds. are 3-in. V. F. brick, including 4-in. concrete base, at $3.87, and 18,600 sq. yds. are 3-in. V. F. brick on natural soil at $2.60. [m] Total includes 3,200 sq. yds. brick on sand base at $2.17, and 7,949 sq. yds. on concrete base at $5.00. [n] 2-in. top, natural asph., $3.91; oil asph., $3.72; 1½ in. top, natural asph., $3.50; oil asph., $3.28.

II—Tar Concrete and Warrenite-Bitulithic

Name of City	Tar Concrete		Warrenite-Bitulithic	
	Area	Cost	Area	Cost
Alabama:				
Bessemer	....	.....	60,000	$307,000.00[b]
Montgomery	....	.....	18,352	3.60-3.40[e]
Arizona:				
Tucson	....	.....	8 mi.	2.80[e]
Arkansas:				
Little Rock	....	.....	31,800	1.90[e]
California:				
Eureka	....	.....	1,814	2.83[b]
Los Angeles	....	.....	93,606	302,609.00[e]
Colorado:				
Trinidad	....	.....	43,700	2.75[b]
Georgia:				
Columbus	....	.....	40,000	33,926.54[a]
Idaho:				
Boise	....	.....	1,718	2.30[b]
Iowa:				
Des Moines	....	.....	5,583.79	19,235.26[e]
Orange City	....	.....	40,000	3.99
Kansas:				
McPherson	2,000	$2.54	....	.....
Louisiana:				
New Orleans	....	.....	56,457	368,083.00
Massachusetts:				
Cambridge	....	.....	64,081	3.00[x]
Minnesota:				
Hibbing	....	.....	47,634	5.30[b]
Rochester	....	.....	32,000	4.24[e]
Missouri:				
St. Louis	....	.....	87,695	345,585.20
New Hampshire:				
Laconia	376	752	....	.....
New Jersey:				
Bloomfield	....	.....	43,000	140,000.00
East Orange	....	.....	5,862	17,948[b][a]
Irvington	....	.....	25,000	3.70[b]
New York:				
Middletown	....	.....	10,600	4.65[e]
New Rochelle	....	.....	3,433	3.25-3.45[a]
Niagara Falls	....	.....	10,431	64,387.87[x]
No. Tonawanda	....	.....	36,080	157,330.00[e]
Oneida	....	.....	20,577	3.95[e]
North Carolina:				
Greensboro	....	.....	12,000	38,000.00[x]
Wilson	....	.....	78,000	3.90[b]
North Dakota:				
Fargo	....	.....	37,467	244,020.00[e]
Ohio:				
Hillsboro	....	.....	17,000	4.73[e]
Oregon:				
Klamath Falls	....	.....	10,839	2.94[x]
Pennsylvania:				
Lebanon	....	.....	21,866	3.56-3.90
Rhode Island:				
Pawtucket	....	.....	2,528	4.00
South Carolina:				
Columbia	....	.....	40,000	2.76[b]
Texas:				
Dallas	....	.....	231,431.21	1,108,402.31[x]
Fort Worth	....	.....	94,409.94	350,000.00[b]
Waxahachie	....	.....	94,993	380,553.20[x]
Washington:				
Puyallup	....	.....	5.418	17,091.00[x]
Wyoming				
Casper	....	.....	2,500	2.53[b]

For footnotes see page 121

III—Asphalt Macadam and Tar Macadam

Name of City	Asphalt Macadam		Tar Macadam	
	Area	Cost	Area	Cost
Alabama:				
Gadsden	15,000	.....	....	.....
Arkansas:				
Little Rock	43,000	2.75[b]	....	.....
California:				
Napa	4,055	76½[e]	....	.....
So. Pasadena	45,667	60,000[e]	....	.....
Connecticut:				
New Haven	74,341	180,000[x]	....	.....
Putnam	1,000	2.00[b]	....	.....
Florida:				
Fort Myers	....	.....	4,000	.....
Sanford	15,000	1.54[b]	....	.....
St. Augustine	3 mi.	1.50	....	.....
Georgia:				
Rome	18,000	2.30[b]	....	.....
Illinois:				
Bloomington	2,000	1.40[e]	....	.....
Chicago	155,935	$3.08	....	.....
Danville	....	.....	5,000	2.80[b]
Indiana:				
West Lafayette	9,600	3,700[e]	....	.....
Kansas:				
Wichita	8,000	1.75[b]	....	.....
Kentucky:				
Ashland	....	.....	1,996.50	5.45[x]
Missouri:				
Frederick	....	.....	10,111	5,714[e]
Mass.				
Andover	....	.....	1 mi.	.....
Brockton	45,400	2.00[e]	....	.....
Cambridge	....	.....	62,556	1.75[x]
Dartmouth	6,800	6,762[e]	31,972	28,473[e]
Easthampton	....	.....	5,400	2.35[e]
Lawrence	92,783	1.62	....	.....
Lynn	52,689	1.63[e]	....	.....
Provincetown	....	.....	5 mi.	1,000
Quincy	69,572	168,698[x]	....	.....
Springfield	75,000	1.76[e]	8,500	1.89[e]
Webster	....	.....	1,600	2,500[e]
Michigan:				
Grand Rapids	....	.....	20,220	27,480[x]
Ironwood	....	.....	11,800	.....
Minnesota:				
Red Wing	....	.....	6,160	11,045[e]
St. Paul	....	.....	13,240	23,238[x]
Missouri:				
Carthage	....	.....	21,319	19[d]
Jefferson City	7,610	1.00-1.40[b]	....	.....
Kansas City	7.62 mi.	172,310	....	.....
St. Louis	23,010	49,456.75	....	.....
Webster Grove	....	.....	25,000	5,000[d]
New Hampshire:				
Laconia	24,731	.....	....	.....
New Jersey:				
Bloomfield	10,000	35,000	....	.....
East Orange	....	.....	2,700	2,160
Englewood	63,360	79,200[e]	....	.....[f]
Fort Lee	....	.....	10,800	[b]
Freehold	....	.....	900	.....
Garfield	26,570	46,182[e]	....	.....
Montclair	7,300	25,800[x]	....	.....
Newton	6,660	.81[a]	....	.....
Nutley	....	.....	1,800	4,700[x]
Summit	....	.....	4,000	1.25[a]
New York:				
Dansville	....	.....	1,500	.....
Haverstraw	22,000	30,000	....	.....
Herkimer	1,400	.30[e]	....	.....
Little Falls	....	.....	1,155	2.10[b]
Brooklyn Boro.	24,000	1.68	....	.....
Queens Boro	275,000	.....	....	.....
Richmond Boro	35,430	2.67[e]	....	.....
Oneonta	400	1.85[e]	....	.....
Poughkeepsie	11,565	29,316[e]	....	.....
Rochester	....	.....	9,000	2.62[b]
Plattsburgh	20,000	2.20[b]	....	.....
Ohio:				
Akron	....	.....	16,080	1.21
Bucyrus	....	.....	1 mi.	.....
Lima	....	.....	16,737	56,958.17[x]
Pennsylvania:				
Norristown	....	.....	1 mi.	28,000
Parkesburg	....	.....	11,700	2,000
Sewickley	....	.....	1,800	1.07
Uniontown	....	.....	5,264	3.30[x]
Rhode Island:				
Pawtucket	....	.....	18,148	2.00[b]
Westerly	....	.....	10,280	1.65[b]
Woonsocket	51,600	2.00	....	.....
So. Carolina:				
Greenville	400	2.00[x]	....	.....
Tennessee:				
Jackson	20,000	1.15[e]	....	.....
Virginia:				
Norfolk	4,800	6,500	....	.....
Salem	6,200	2.50[e]	....	.....
W. Virginia:				
Bluefield	1,200	3.00[b]	....	.....
Wisconsin:				
Kaukauna	....	.....	18,053	1.20[e]
Lake Geneva	....	.....	100	.....
Madison	2,455	2.12[b]	....	.....
Milwaukee	....	.....	288,373	193,121
Wausau	....	.....	4,000	8,000

For footnotes see page 121

IV—Stone Block and Brick

Name of City	Stone-Block		Brick	
	Area	Cost	Area	Cost
Alabama:				
Selma	.....	.....	15,000	.....
California:				
San Francisco	.....	.....	2,881	14,681[e]
Colorado:				
Trinidad		.....	12,400	3.70[b]
Connecticut:				
Hartford	2,910	20,031.54[e]	.....	.....
New Haven	309	2,400	1,055	19,500
Florida:				
St. Petersburg	.....	.....	200,000	2.65[a]
Georgia:				
Columbus	.....	.....	110,331	404,774.35

Name of City	Stone-Block		Brick	
	Area	Cost	Area	Cost
Illinois:				
Bloomington	.....	.....	14,000	4.50[e]
Canton	.....	.....	5,900	3.72[e]
Chicago	4,688.00	7.00-7.39[p]	28,601.00	5.70-5.85[x]
Danville	.....	.....	30,000	2.63[e]-4.05[b]
East Moline	.....	.....	5,830	43,189.66
Jacksonville	.....	.....	6,570	35,000.00
Murphysboro	.....	.....	20,000	90,000.00[x]
Peoria	.....	.....	6,738	2.80[b]
Indiana:				
Elkhart	.....	.....	7,800	44,300.00
Fort Wayne	.....	.....	4,219	31,874.83[x]
Lafayette	.....	.....	10,448	3.95[e]
Iowa:				
Cedar Rapids		....	5,020	26,375.00[x]
Des Moines	.....	.....	51,866.65	228,487.30[e]
Iowa City	.....	.....	600	4.50[b]
Kansas:				
Chanute	.....	.....	11,363	44,899.62[x]
Dodge City	.....	.....	30,000	3.90[b]
Ottawa	.....	.....	10 blocks	.....
Parsons	.....	.....	3,500	3.04[b]
Pratt	.....	.....	40,000	3.98[b]
Topeka	.....	.....	2,891.5	11,912.98
Wichita	.....	.....	70,000	3.98-4.35[b]
Kentucky:				
Ashland	.....	.....	11,021	8.32—8.48[x]
Covington	.....	.....	5,300	3.25[b]
Louisiana:				
Lake Charles	.....	.....	7,000	4.00
New Orleans	8,020	172,693	.....	.....
Maine:				
Portland	4,482.67	15,350.20[e]	2,138.23	15,133.66[e]
Massachusetts:				
Brockton	1,557	2.85[e]	.....	.....
Cambridge	7,000	8.00[x]	.....	.....
Holyoke	4,600	.....	.....	.....
Lawrence	2,865	6.04	.....	.....
Lynn	22,116	2.59[e]	.....	.....
Pittsfield	.....	.....	8,587	4.88[e]
Springfield	4,264	7.03[e]	.....	.....
Michigan:				
Battle Creek	.....	.....	11,904	2.65[e]
Detroit	30,648	.....	48,912	.....
Grand Rapids	.....	.....	10,615	50,000.00[x]
Niles	.....	.....	1,400	7.00[c]
Minnesota:				
Minneapolis	14,400.00	72,000.00[e]	25,651.00	129,042.00[e]
Rochester	.....	.....	17,000	5.00[e]
St. Paul	.....	.....	51,318	265,686[x]
Winona	.....	.....	2,100	1.38
Mississippi:				
Hattiesburg	.....	.....	24,100	102,291[x]
Missouri:				
Jefferson City	.....	.....	2,640	4.00[b]
Kansas City	44 mi.	53.420	3.83 mi.	276,000
St. Charles	.....	.....	1,333	4.50[e]
St. Louis	5,640	50,285.10	33,116	213,627.90
Nebraska:				
Fremont	.....	.....	1,400	4.24[e]
Lexington	.....	.....	42,500	4.25[e]
Lincoln	.....	.....	10,990	4.07[e]
Nebraska City	.....	.....	40,000	3.61
Omaha	.....	.....	94,137	390,881.33[b]
New Jersey:				
Newark	36,279	3.50	.....	.....
New York:				
Albany	16,746.8	72,730.61[h]	3,448.4	14,461.12[e]
Binghamton	.....	.....	1,726	11,307[e]
Buffalo	.....	.....	8,686	48,471[x]
Corning	.....	.....	19,053	111,810.71[x]
Dansville	.....	.....	6,000	30,000[x]
Glens Falls	.....	.....	1,307.07	3.65[e]
Br'klyn Boro.	30,600.00	7.76[e]	.....	.....
Bronx Boro.	86,681.00	5.93[e]	.....	.....
M'h't'n Boro.	186,700.00	1,960,110.00[x]	.....	.....
R'hm'nd Boro	33,000.00	.....	.....	.....
Queens Boro.	31,219.00	6.47[e]	.....	.....
Niagara Falls	.....	.....	22,422	148,669.50[x]
Olean	.....	.....	52,300	2.51[e]
Poughkeepsie	.....	.....	1,752	11,156.00[e]
Rochester	.....	.....	1,040	4.85[b]
Schenectady	4,642	.....	.....	.....
Watertown	.....	.....	8,469	4.30[e]
North Dakota:				
Fargo	.....	.....	19,265	142,584.00[e]
Ohio:				
Akron	.....	.....	42,705	2.40[e]
Ashtabula	.....	.....	21,261	5.15-5.22[x]
Barnesville	.....	.....	27,000[e]	9,431.00
Bellaire	.....	.....	1,539	5.30[x]
Cleveland	22,102	209,700.00[x]	186,830	1,187,930.00[x]
Cuyahoga Falls	.....	.....	5,330	4.90[b]
Jackson	.....	.....	10,523	42,000.00[b]
Lancaster	.....	.....	14,702	54,166.55[x]
London	.....	.....	12,000	.....
Lorain	.....	.....	14,558	95,871.79[x]
Middletown	.....	.....	8,220	4.20[e]
Nelsonville	.....	.....	1,140	19,161.10[x]
New Boston	.....	.....	10,870	3.54[b]
Niles	.....	.....	10,433	60,040.00[e]
Oberlin	.....	.....	2,800	15,000.00[x]
Salem	.....	.....	13,000	1.74
Toledo	5,550	6.25[b]	8,791	4.35[b]
Ohio—Continued.				
Wooster	.....	.....	7,000	38,000.00
Zanesville	.....	.....	9,338	31,599.00[x]
Pennsylvania:				
Carrick	.....	.....	6,638	22,394.20[b]
Clearfield	.....	.....	1,000	.....
Connellsville	.....	.....	12,419	58,585.00[x]
Duquesne	7,515	6.70	.....	.....
Farrell	.....	.....	34,300	3.05-3.30[e]
Greensburg	.....	.....	9,247.4	3.38[b]
Greenville	.....	.....	4,000	4,000.00
Huntingdon	.....	.....	4,500	3.92[e]
Kingston	.....	.....	5,240	4.90[e]
North Braddock	.....	.....	1,006	3.15
Oil City	.....	.....	3,500	3.35-3.45[b]
Pittsburgh	27,400	5.00[b]	33,000	3.60[b]
Pottstown	.....	.....	13.722.81	41,460.09
Rankin	.....	.....	2,500	10,000.00
St. Marys	.....	.....	3,416	18,276.00[e]
Wilkinsburg	.....	.....	1.62 mi.	82,838.00[j]
Williamsport	.....	.....	7,546	3.76[e]
York	.....	.....	775	5.25
Rhode Island:				
Pawtucket	895	.....	.....	.....
South Carolina:				
Spartanburg	.....	.....	2,300	.....
Texas:				
Amarillo	.....	.....	19,000	55,000.00
Cisco	.....	.....	21,100[k]	2.60-3.87
Eastland	.....	.....	17,542	5.14[e]
Fort Worth	.....	.....	32,787.38	100,000.00[b]
Texarkana	.....	.....	125,000	3.60-4.15
Virginia:				
Danville	11,082	62,292.00[e]	.....	.....
Norfolk	6,328	9,818.27[e]	.....	.....
Washington:				
Seattle	1,969	6.00[b]	59,991	5.00[b]
West Virginia:				
Fairmont	.....	.....	111.47[m]	2.17-5.00
Parkersburg	.....	.....	10,100	6.80[e]
Wheeling	.....	.....	10,992	105,850.00
Wisconsin:				
Madison	.....	.....	437	5.25[b]
Milwaukee	30,321.69	170,934.55[b]	.....	.....
Sparta	.....	.....	1 block	.....
Wisconsin Rapids	.....	.....	2,500	.....

P—Granite block $7.00, sandstone block $7.39.

Paving Notes

OTHER KINDS OF PAVEMENT

In addition to the paving tabulated, certain other kinds were reported from various cities but from too few to warrant a separate column in the table. Among the pavements so reported are the following:

Vibrolithic, Montgomery, Ala., 33,403 square yards at $3.25 and Brazil, Ind., 1,000 square yards at $3.35.

Sheet asphalt on old macadam, Hartford, Conn., 19,918 square yards. Sheet asphalt on brick, Danville, Ill., 20,000 square yards at $2.47.

Aspalt block, Fort Myers, Fla., 29,000 square yards; Lockport, N. Y., 21 mi.; and Rochester, N. Y., 380 square yards at $5.55.

Rock asphalt, Kansas City, Mo., .73 mi.; Arlington, Mass., 1,410 square yards; Chanute, Kans., 7,806 square yards; Covington, Ky., 15,000 square yards at $3.50; Beaumont, Tex., 12,400 square yards at $3.00; Dallas, Tex., 59,846 square yards; and Denton, Tex., 26,412 square yards at $2.35.

Amiesite, Stratford, Conn., 2,000 square yards; Hazleton, Pa., 510 square yards; and Kingston, Pa., 7,020 square yards at $3.95.

Willite, Lima, Ohio, 3,498 square yards; Kingston, N. Y., 50,000 square yards; Mt. Vernon, N. Y., 75,000 square yards; Waterford, N. Y., 21,000 square yards; Cohoes, N. Y., 5,000 square yards; Great Bend, Ore., 75,000 square yards; Holland, Mich., 25,000 square yards, and Willite on old brick, Connellsville, Pa., 18,086 square yards.

Hassam bicomac, Portland, Me., 6,044 square yards. Hassam compressed concrete, Arlington, Mass., 3,721 square yards.

National pavement, East Orange, N. J., 18,600 square yards on telford and 9,322 on concrete.

Shell, Beaumont, Tex., 37,500 square yards at $.90.

Durax, Norfolk, Va., 13,383 square yards.

Resurfacing tar macadam, Caruthersville, Mo., 52,000 square yards at $.15. Asphalt resurfacing, Montclair, N. J., 21,000 square yards 3 inches thick; Akron, Ohio, 122,400 square yards; Danville, Va., 39,187 square yards; Fredericksburg, Va., 6,600 square yards at $.05; and Milwaukee, Wis., 45,373 square yards. Asphalt concrete resurfacing, Fulton, N. Y., 39,000 square yards 2 inches thick at $1.87; and Portland, Ore., 48,825 square yards. Brick resurfacing, Sandusky, Ohio, 12,927 square yards at $2.54.

COST OF GRADING

In our paving questionnaire, the informants were asked to state, in reporting the cost of paving, what items were included in the sum named. The majority included only surface and foundation or surface only, but a number stated that the cost named covered not only paving but also curbs and gutters, sewers, catch basins, and in some cases sidewalks and other items of street improvement. It is apparent that where the cost included items other than wearing surface and base, the figure of cost given meant very little since it was impossible to know what percentage of the cost was for pavement only and what for the other features of the street improvement.

Of those that included in the cost, items other than surface and base, probably the majority included only grading in addition thereto. In Iowa the grading included in cost of pavement is that displaced by the new pavement, any additional excavation being paid for extra, this being required by law if assessments for paving are to be legal. However, even with this understanding, there is nothing to indicate whether the material removed was simply natural soil or was old macadam or telford, or what was the depth of material removed when this was less than the pavement thickness.

In a few instances the engineers reported the cost of grading separate from the paving. For instance, in Globe, Ariz., in laying 27,325 square yards of concrete pavement, there was 7,513 cubic yards of grading which cost $17,655, or more than 13 per cent of the entire cost of the improvement. In Longmont, Colo., where concrete pavement cost $2.25 not reinforced and $2.48 reinforced, the grading cost in addition to this is $1.00 per cubic yard. In Boise, Ida., $2.60 per square yard paid for warrenite-bitulithic included $.30 per square yard for grading. In Edwardsville, Ill., grading constituted 9 per cent of the total cost of the one-course concrete pavement. In Ottawa, Ill., excavating cost $.70 per cubic yard, and in St. Charles, Ill., $.75. In Hiawatha, Kans., grading cost $1.00 per yard and in Pratt, Kans., $.98. In Detroit, Mich., the cost of sheet asphalt, including an 8-inch concrete base, stone curb, excavation, etc., averaged $6.28 per square yard, while the top only averaged $2.00; the cost of asphalt concrete including a 6-inch concrete base, excavation, etc., averaged $5.46 and the top only $1.10. In laying one-course concrete in alleys the average price was $2.05 without excavation and $2.75 including excavation.

(To be continued)

Table No. 1—City Paving Done in 1921—V.—Creosoted Wood Block, Concrete Reinforced and Concrete Not Reinforced

	Creosoted Wood Block		Concrete, Reinforced		Concrete, Not Reinforced	
	Area	Cost	Area	Cost	Area	Cost
Alabama:						
Montgomery	....	......	....	......	33,403.00	3.25
Arizona:						
Globe	....	......	....	......	27,325.00	132,526.00[e]
Tucson	....	......	....	......	2,000.00	3.32[e]
Arkansas:						
Little Rock	....	......	....	......	22,500.00	3.25[a]
Pine Bluff	....	......	27,670	......	......	......
California:						
Calexico	....	......	....	......	100‖	900.00
Los Angeles	....	......	....	......	96,409.00	442,998.00[e]
Napa	....	......	....	......	7,900.00	2.43-2.88[a]
Palo Alto	....	......	....	......	40,000.00	65.600.00[e]
San Bernardino	....	......	....	......	98,747.00	144,800.00
San Francisco	....	......	....	......	16,189.00	48,559.00[e]
Santa Maria	....	......	....	......	2,667.00	40,000.00
Vallejo	....	......	....	......	4,220.00	......
Whittier	....	......	....	......	24,888.00	57,679.00[e]
Colorado:						
Longmont	....	......	25,375	2.48[a]	7,194.00	2.25[a]
Connecticut:						
Bristol	....	......	....	......	22,500.00	41,500.00[a]
Hartford	....	......	....	......	9,263.00	......
New Haven	....	......	....	......	15,847.00	27,000.00[x]
Norwich	....	......	....	......	......	50,000.00
Rockville	....	......	....	......	450	......
Georgia:						
Athens	....	......	....	......	27,589.00	61,000.00
Missouri:						
Carthage	....	......	....	......	20,514	2.66½[e]
Kansas City	....	......	....	......	3.11 mi.	210,000
Sedalia	....	......	....	......	440	1,097.80[e]
Springfield	....	......	....	......	6,000	2,55[x]
St. Louis	5,735	55,068.75	11,565	59,254.30	28,780	84,993.14
Nebraska:						
Fremont	....	......	....	......	22,143	3.11[e]
Lincoln	....	......	....	......	7,247	2.60[e]
Omaha	1,928	9,689.20[b]	....	......	7,853	25,009.47[b]
So. Sioux City	....	......	....	......	72,000	3.84
Nebraska:						
Reno	....	......	....	......	5,000	9,900
New Hampshire:						
Laconia	....	......	....	......	49	......
New Jersey:						
Bayonne	....	......	5,839	2.75	......	......
Freehold	....	......	50,000	......	......	......
Irvington	....	......	38,000	2.50[e]	......	......
Millville	....	......	13,000	2.78	......	......
Newark	....	......	28.169	3.35	......	......
Newton	....	......	2,854	3.38[a]	......	......
Nutley	....	......	688	3,516[x]	......	......
New York:						
Albany	....	......	....	......	688.3	8,909.01[e]
Binghamton	....	......	3,245	17,854[e]	......	......
Fulton	....	......	6,737	3 20[x]	......	......
Gloversville	....	......	18,754	64,049[x]	......	......

Illinois:						
Benton	....	.....	17,891	3.47[a]	.....	.....
Bloomington	....	.....	3,036	3.50[c]	233	300[c]
Champaign	....	.....	30,500	103,000.00	.....	.....
Chicago	53,075	7.00	....	.....	15,891	3.43
Chicago Hgts.	....	.....	....	.....	2,115.06	9,591.00[x]
Edwardsville	....	.....	....	.....	3,183.00	10,436.00[c]
East Alton	....	.....	21,500	.....	.....	.....
East Moline	....	.....	5,856.4	17,322.8[x]	.....	.....
Evanston	....	.....	....	.....	1,940.00	.....
Joliet	6,300	4.25[b]	....	.....	.....	.....
Marion	....	.....	10,732	3.65[a]	.....	.....
Ottawa	....	.....	13,400	2.78[a]	.....	.....
Quincy	2,808	5.40[c]	4,200	4.25[c]	.....	.....
St. Charles	....	.....	14,200	2.77[a]	.....	.....
Indiana:						
Brazil	....	.....	....	.....	5,000	3.33[x]
Covington	....	.....	9,200	40,000[c]	.....	.....
Elwood	....	.....	....	.....	4,500	3.90[c]
Fort Wayne	....	.....	....	.....	3,641	9,305.38[x]
Gary	....	.....	94,771	3.40[x]	22,676	2.45
Kendallville	....	.....	15,000	58,500	.....	.....
Lafayette	....	.....	....	.....	4,419	2.07[c]
Marion	....	.....	....	.....	756	.....
New Albany	....	.....	1,620	.....	16,850	.....
Noblesville	....	.....	....	.....	137,580[a]	27,500
Portland	....	.....	10,000	35,025[x]	.....	.....
South Bend	....	.....	....	.....	4,058	2.57[b]
Iowa:						
Ames	....	.....	45,173.62	157,507.63[a]	.....	.....
Atlantic	....	.....	....	.....	4,000	4.25
Cedar Rapids	....	.....	....	.....	9,374	28,451[x]
Cherokee	....	.....	1,795	10,706.97[a]	4,206	10,598.70[a]
Clinton	....	.....	78,986	282,678	.....	.....
Des Moines	....	.....	....	.....	39,314.44	134,297.85[c]
Iowa City	....	.....	35,000	3.12[b]	.....	.....
Newton	....	.....	1,945	5.59[b]	.....	.....
Ottumwa	....	.....	10,000	55,402[c]	.....	.....
Perry	....	.....	....	.....	40,000	3.99[c]
Kansas:						
Atchison	....	.....	....	.....	900	2.56
Chanute	....	.....	....	.....	1,890	4,351.46[x]
Hiawatha	....	.....	900	2.74[a]	.....	.....
McPherson	....	.....	....	.....	2,000	2.54[c]
Topeka	....	.....	....	.....	15,970.1	40,847.09
Wichita	....	.....	....	.....	70,725	1.83-2.75[a]
Maine:						
Portland	....	.....	....	.....	2,097.63	7,820.35[c]
South Paris	....	.....	....	.....	17,520	.....
Massachusetts:						
Athol	....	.....	3,510	8,000[c]	.....	.....
Brockton	....	.....	....	.....	4,900	4.32[c]
Holyoke	....	.....	13,000	.....	28,000	.....
Millbury	....	.....	1½ mi.	87,000	.....	.....
Pittsfield			12,506	3.07[c]	13,768	3.49[c]
Michigan:						
Alma	....	.....	....	.....	30 064	2.65
Ann Arbor	....	.....	....	.....	2,000	.....
Detroit	....	.....	....	.....	292,746	.....
Grand Rapids	....	.....	72,533	324,270[x]	.....	.....
Highland Park	....	.....	....	.....	14,799.97	45,242.94[x]
Owosso	....	.....	....	.....	17,000.00	2.47[a]
Minnesota:						
Chisholm	....	.....	13,500	3.80[c]	.....	.....
Crookston	....	.....	7,000	.....	.....	.....
Duluth	....	.....	115,000	2.60[a]	.....	.....
Faribault	....	.....	520	3.83[c]	.....	.....
Minneapolis	96,215	506,030[a]	....	.....	37,934	126,684[c]
Rochester	6,000	6.00[c]	....	.....	2.000.00	3.42[c]
St. Paul	55,509	341,203[x]	66,355	194,748[x]	.....	.....
Two Harbors	....	.....	145,000	45,508[x]	.....	.....
Gouverneur	....	.....	....	.....	3,028	1.17-1.70[c]
Herkimer	....	.....	7,000	3.10[c]	.....	.....
Hudson	....	.....	....	.....	17,000	36,000
Lackawanna	....	.....	500	6,700[x]	.....	.....
Little Falls	....	.....	8,750	3.99[a]	.....	.....
Lockport	....	.....	3.3 mi.	213,775.29	.....	.....
Middletown	....	.....	20,000	3.58[c]	.....	.....
Manhattan Boro.	5,085	62,800[x]	....	.....	.....	.....
Queens Boro.	17,000	.....	....	.....	.....	.....
Richmond Boro.	....	.....	134,760	5.78[c]	14,942	4.24[c]
Olean	....	.....	10,800	2.45-3.00[a]	.....	.....
Port Chester	....	.....	....	.....	5,300	17,134.00[c]
Port Jervis	....	.....	4,256	3.58[c]	.....	.....
Poughkeepsie	....	.....	15,073	51,594.00[c]	.....	.....
Schenectady	....	.....	1,085.6	4,505.94[x]	.....	.....
North Carolina:						
Asheville	....	.....	....	.....	1,836	4,500
Marion	....	.....	....	.....	15,000	2.00[a]
Mount Airy	....	.....	....	.....	18,454	40,916.16
North Dakota:						
Fargo	....	.....	708	2,785.00[c]	.....	.....
Ohio:						
Akron	....	.....	1,943	9,399.10	.....	.....
Bellaire	....	.....	4,499	4.05[c]	.....	.....
Lakewood	....	.....	15,629	3.80[b]	.....	.....
Lorain	....	.....	27,308	118,682.48[x]	.....	.....
Sandusky	....	.....	13,444	2.50[b]	.....	.....
Toledo	....	.....	14,963	3.50[a]	1,032	2.78[a]
West Park	....	.....	4,268	21,370.00[x]	.....	.....
Oklahoma:						
Ada	....	.....	....	.....	10 blocks	56,000
Oregon:						
Astoria	....	.....	....	.....	19,478	98,954.00[x]
Eugene	....	.....	....	.....	8,000	1.17[a]
Oregon City	....	.....	1,400	2.65[a]	4,600	2.50[a]
Portland	....	.....	....	.....	125,540	404,639.00[x]
Salem	....	.....	....	.....	17,685	45,895.00
Pennsylvania:						
Carrick	....	.....	440	1,254.00[b]	.....	.....
Du Bois	....	.....	300	4.00[x]	1,700	3.60
Lebanon	....	.....	29,479	2.75-3.10[c]	.....	.....
Munhall	....	.....	....	.....	14,905	58,780.00[a]
Pittsburg	....	.....	7,000	3.25[b]	14,000	3.25[b]
Tyrone	6,400	461[c]	....	.....	.....	.....
Wilkinsburg	....	.....	⅛ mi.	8,680.00	.....	.....
South Carolina:						
Greenville	....	.....	....	.....	5,200	3.85[x]
South Dakota:						
Mitchell	....	.....	450	.....	.....	.....
Tennessee:						
Cleveland	....	.....	....	.....	7,612	19,214.00[b]
Texas:						
Cisco	....	.....	2,000	3.46[a]	.....	.....
Forth Worth	....	.....	....	.....	1,283.22	3,500.00[b]
Waxahachie	....	.....	....	.....	2,958	.....
Wichita Falls	....	.....	40,113	228,100.00	9,000	41,900.00
Utah:						
Logan	....	.....	3,434	2.70	.....	.....
Vermont:						
Barre	....	.....	3,226	3.12-3.27[c]	.....	.....
Rutland	....	.....	17,133	2.90	.....	.....
Virginia:						
Newport News	....	.....	....	.....	8,090	2.10-4.00
Petersburg	....	.....	5,500	2.67[c]	22.000	3.13[c]
Suffolk	....	.....	....	.....	2,600	3.00
Washington:						
Bellingham	....	.....	....	.....	22,333	61,679.00[a]
Chehalis	....	.....	....	.....	12,113	2.50[a]
Dayton	....	.....	....	.....	7.200	21,000.00[c]
Puyallup	....	.....	....	.....	14.920	50,700.00[x]
Raymond	....	.....	....	.....	2,050	10,140.00[x]
Seattle	....	.....	....	.....	313,444	2.45[b]

For footnotes see page 121

	Creosoted Wood Block		Concrete, Reinforced		Concrete, Not Reinforced	
West Virginia:	Area	Cost	Area	Cost	Area	Cost
Bluefield	....	.....	....	.....	1,000	2.75
Fairmont	....	.....	....	.....	4,526	2.89-3.00
Parkersburg	....	.....	19,500	2.05-2.65[a]	.....	.....
Wheeling	....	.....	4,442	21,611.18	.....	.....
Wisconsin:						
Edgerton	....	.....	17,000	2.56[a]	.....	.....
Fond du Lac	....	.....	25,000	3.25	.....	.....
Lake Geneva	....	.....	....	.....	10,000	20,000.00
Madison	4,639	5.50[b]	7,400	2.10[a]	.....	.....
Manitowoc	....	.....	70,000	3.16[a]	.....	.....
Marshfield	....	.....	15,000	3.35	.....	.....
Oshkosh	....	.....	9,694	23,263.85[a]	6,241	18,062.00[a]
Randolph	....	.....	....	.....	30,000	2.99
Sheboygan	....	.....	80,148	187.165.00[a]	.....	.....
Superior	....	.....	6,000	17,000.00[x]	.....	.....
Waukesha	....	.....	....	.....	12,700	2.25-2.50
Wausau	....	.....	....	.....	500	1,500.00
Wisconsin Rapids	....	.....	....	.....	28,000	2.69

For footnotes see page 121

VI—Waterbound Macadam, Gravel, and Cement Sidewalks

	Waterbound Macadam		Gravel		Cement Sidewalks	
Name of City	Area	Cost	Area	Cost	Area	Cost
Alabama:						
Bessemer	.....	.....	.....	.....	2,400	.....
Gadsden	.....	.....	10,000	.....	5,200	.....
Montgomery	.....	.....	15,275	.63-1.08	.....	.....
			5,000	.....	.....	.....
Arizona:						
Globe	.....	.....	.....	.....	9,473	3,315.00
Arkansas:						
De Queen	.....	.....	48,000	600.00	.....	.....
Fayetteville	3,000	1.10	.....	.....	20,000[a]	.25
Little Rock	.....	.....	16[†]	.....	.....	.....
California:						
Alameda	2,500	4,272.00[x]	.....	.....	.....	.....
Berkeley	.....	.....	.....	.....	200,000[a]	.24
Calexico	.....	.....	.....	.....	1[†]	.....
Eureka	.....	.....	.....	.....	87,000[a]	.14
Los Angeles	.....	.....	.....	.....	1,460,941[a]	362,526.00
Palo Alto	.....	.....	.....	.....	13,500[a]	.20
San Bernardino	.....	.....	.....	.....	.....	5,000.00
San Francisco	.....	.....	.....	.....	20,573	36,929.00
Santa Maria	.....	.....	.....	.....	20,000[a]	.20
So. Pasadena	.....	.....	.....	.....	5,000	750.00
Whittier	.....	.....	.....	.....	2,203	3,768.00
Colorado:						
Pueblo	.....	.....	.....	.....	4,000	.....
Connecticut:						
Manchester	5,072	.95	.....	.....	80,000[a]	.16
New Britain	12,000	.85	.....	.....	.....	.21
Rockville	2,200	3,000.00[a]	.....	.....	2,500	8,545.00
Stratford	.....	.....	6[†]	1.00[‡]	.....	.....
Williamantic	.....	.....	.....	.....	43,284[a]	.....
Florida:						
Fort Lauerdale	26,000	.81[s]	.....	.....	2,000[a]	.21½
Sanford	.....	.....	.....	.....	6,000	.25
St. Petersburg	.....	.....	.....	.....	10,000	1.53
Georgia:						
Athens	.....	.....	.....	.....	40,000[a]	6,800.00
Columbus	.....	.....	.....	.....	5,894	7,662.20
Rome	28,000	1.60	79,000	1.20	9,000	2.00
Idaho:						
Boise	.....	.....	.....	.....	73,500[a]	.18
New Ulm	.....	.....	.....	.....	3,800	1.09
Rochester	.....	.....	10,000[‡]	1.60	26,000	1.60
St. Paul	.....	.....	.....	.....	13[†]	43,386.00
Winona	.....	.....	.....	.....	11,760	1.17
Mississippi:						
Canton	.....	.....	.....	.....	400[a]	.25
Missouri:						
Joplin	835	470.00	.....	.....	.....	.....
Kansas City	.....	.....	.....	.....	5.22[†]	39,500.00
Sedalia	.....	.....	.....	.....	10,000[a]	2,000.00
Springfield	.....	.....	.....	.....	2,700	2.21
St. Charles	.....	.....	.....	.....	1,000[a]	.20
St. Louis	.....	.....	.....	.....	37,089[a]	15,651.00
Webster Grove	.....	.....	.....	.....	4,000	10,400.00
Montana:						
Havre	.....	.....	16,000	.12	.....	.....
Nebraska:						
Lincoln	.....	.....	.....	.....	123,645[a]	.19
Omaha	.....	.....	.....	.....	501,000[a]	100,320.00
Scottsbluff	.....	.....	.....	.....	24,000[a]	.17
Nevada:						
Reno	.....	.....	.....	.....	4,500	8,100.00
New Jersey:						
East Orange	.....	.....	.....	.....	2,852[a]	616.20
Englewood	.....	.....	.....	.....	6,000[s]	7,040.00
Fort Lee	.....	.....	.....	.....	3,200[a]	.34
Freehold	.....	.....	.....	.....	1[†]	.....
Garfield	.....	.....	.....	.....	115,300[a]	39,558.00
Irvington	.....	.....	.....	.....	10,000	.....
Montclair	.....	.....	.....	.....	10,000[a]	3,000.00
Newark	.....	.....	.....	.....	103,635	.26
Newton	.....	.....	6,100	.....	.....	.....
Phillipsburg	1,200	3,000.00	.....	.....	.....	.....
Summit	7,200	.75	.....	.....	3,300[a]	.30
Wallington	.....	.....	.....	.....	21,947[a]	4,833.00
New York:						
Albany	.....	.....	.....	.....	74,564.11	20,805.46
Binghamton	.....	.....	.....	.....	.....	15,000.00
Buffalo	.....	.....	.....	.....	5.24[†]	.66
Corning	.....	.....	.....	.....	1,435[‖]	1,793.75
Gloversville	.....	.....	25,717	45,298.00	.....	.....
Herkimer	.....	.....	4,500	.80	1,200[a]	.20
Hornell	.....	¼[†]	.....	1[†]	.....	.....
Hudson	5,000	5,000.00	.....	.....	.....	.....
Hudson Falls	.....	.....	.....	.....	2,500[a]	.25
Lackawanna	.....	.....	.....	.....	900	3,890.00
Lockport	.....	.....	.....	.....	550[s]	736.00
New Rochelle	.....	.....	.....	.....	39,600[a]	.32
Niagara Falls	.....	.....	.....	.....	10,220[a]	2,368.34
No. Tonawanda	.....	.....	.....	.....	40,000[a]	.18
Portchester	.....	.....	.....	.....	7[†]	.30[a]
Rochester	.....	.....	.....	.....	70,177[a]	.20
Schenectady	.....	.....	.....	.....	8,134[a]	3,929.44
Watertown	10,000	2.00	.....	.....	19,000[a]	.25
North Carolina:						
Asheville	.....	.....	.....	.....	675	656.00
Greensboro	.....	.....	.....	.....	4,400	.....
North Dakota:						
Fargo	.....	.....	.....	.....	6,195	12,315.00
Ohio:						
Akron	.....	.....	.....	.....	840,000[a]	168,000.00
Alliance	.....	.....	.....	.....	25,000[a]	5,500.00
Ashtabula	.....	.....	.....	.....	20,000[a]	.22
Cuyahoga Falls	.....	.....	.....	.....	100,003[a]	.21½
Fostoria	.....	.....	.....	.....	5,000[‖]	750.00
Jackson	.....	.....	.....	.....	10,000[a]	2,500.00
Lancaster	.....	.....	.....	.....	2[†]	.....
Lima	.....	.....	.....	.....	15,640	32.000.00
Sidney	.....	.....	.....	.....	2,500	.20
Oklahoma:						
Ada	.....	.....	40[‖]	16,000.00	.....	.....
					3,000	1,500.00
					42,000[a]	.16-.24

Illinois:							
Bloomington					35,000		.185
Champaign					15†	1.15-1.20	
Chicago Heights					12,000*		.25
Danville					40,000*		.18
East Moline					7,000*	1,200.00	
Evanston					10,177	18,876.86	
Kewanee					16,427*	3,675.00	
Streator					50,000*	12,500.00	
Indiana:							
Bloomington	4,000	1.20			12,000*		.22
Brazil					2,000		.25
Covington			3,000	3,000.00	2,000*		.20
Elkhart					46,600*	9,700.00	
Fort Wayne					4,981	35,376.17	
Gary					5,117	3.00	
Lafayette			4,673§	1.80	71.500*		.18-.20
Marion					10,000*		
New Albany					35,920*		
Noblesville					26,960*	4,313.60	
South Bend	6,684	2.15			113,115*		.18
West Lafayette			4,100	5,550.00	850	1,350.00	
Iowa:							
Boone					100,000*		
Cedar Rapids					87,000*		
Des Moines					236,173*	47,035.51	
Emmetsburg					1,400	2,300.00	
Newton					450	1.44	
Ottumwa					9,000§		.15*
Kansas:							
Dodge City					15,000		.14
Ottawa					3¶		
Parsons	2,000	1.56			5,000*		.18
Salina					6,000*		.18
Topeka					8,078	2,019.50	
Wichita					110,000*		.18
Kentucky:							
Ashland					10,475		.32
Covington					30,000*		1.30
Louisiana:							
La Fayette			50,000	.80			
New Orleans			7,088	26,807.00	41,693	84,433.00	
Maine:							
Augusta			1.5†		620‖		
Gardiner			1,600				
Portland						2,696.27	
Waterville			16,600	7,480.00	700	2,800.00	
Massachusetts:							
Andover					600‖		
Arlington					17,563.8*	7,025.52	
Athol			2†	8,500.00	1,334	4,200.00	
Brockton			25,600		8,300	1.95	
Dartmouth			17,000				
Easthampton					1,700	.23	
Lawrence					3,099	2.20	
Lynn					8,846	3.21	
Orange			1†	5,000.00			
Pittsfield					7,275	3.10	
Springfield					7,500	2.33	
Webster					2,242	4,050.00	
Michigan:							
Ann Arbor			6†		5,000*		
Battle Creek					90,250*		.12
Hastings			2†		½†		
Ironwood					200,000*		.22
Manistique					1/5†	1,150.00	
Niles					20,000*		.14
Owosso					30,000*		.16
Ypsilanti					30,000*		.20
Minnesota:							
Chisholm					30,000*		.26
Cloquet			1†	2.00‡	26,308*		.16½-.20
Duluth					18†		.22
Faribault			15,000	.20			
Hibbing			80,000		223,200*		.25
Hugo			3,000	1,500.00			
Sapulpa					42,000*		.16-.24
Oregon:							
Astoria	10,261	29,150.00			3,395*		
Eugene			20,000	.60	32,000§		.16
Klamath Falls					20,270*		.28
Oregon City					2,000		1.20
Portland	25,439	57,527.00			383,137*		
Pennsylvania:							
Berwick					54,000*		.16
Clearfield					500		2.00
Du Bois					2,000		1.98
Duquesne					10,500*		
Freeland	3,000	2,100.00			1,000		27,000.00
Greenville					400§		.25
Norristown	1,000	.90					
Oil City					19,914*		.25
Parkesburg	5,066	690.00			682		1,342.00
Slatington					1,000‖		
Shippensburg					3,360*		.15
Walnutport					3,000‖		
Wilkinsburg					½†		.25*
Williamsport					65,000*		.26
Rhode Island:							
Pawtucket	1.13†		0.35†		4,060		
Westerly			2†	2,000.00	1,200‖		1.85¹
South Carolina:							
Chester			23,000	2,300.00	988.4		2,407.04
Greenville					2,000		2.50
Spartanburg					3,000		
Tennessee:							
Clarksville		2†					
Cleveland					5,500		9,700.00
Jackson			10,000	.70			
Texas:							
Beaumont					2,350		1.80
Bonham			55,590	1.60	3,100		2.25
Cameron			2¾†	12,000.00	½†		1,320.00
Cisco					1,000		.25
Dallas					577,511*		115,502.20
Denton			15,000	.62			
Mineral Wells					63,000*		
Vermont:							
Springfield			6,222	1,100.00			
Virginia:							
Norfolk					1,500		1,645.76
Petersburg			192,000	.18	14,400		1.63
Salem	6,000	1.00					
Suffolk					2,778		1.71
Washington:							
Bellingham					9,843*		234,475.00
Dayton					20,000*		4,000.00
Okanogan			60	9,500.00	2,500§		32,000.00
Puyallup			12,940§	8,303.00			
Raymond					1,200		2.25
Seattle			30,200‡		100,000		1.60
West Virginia:							
Bluefield					21,000*		.30
Fairmont	8,513	1.78					
Wisconsin:							
Green Bay					32,000*		.22
Lake Geneva			1,000		500*		
Milwaukee					501,037*		124,450.73
New London					6,000		
Oshkosh					2.5†		13,200.00
Sheboygan					4,000§		4,400.00
Superior					45,000*		12,000.00
Wausau			7,000	6,500.000	62,400*		11,232.00
Wisconsin Rapids			16,000		2½†		.15*
Wyoming:							
Casper					250,000		60,000.00
Sheridan					2.5†		19,800.00

Explanation: *—Square Feet. †—Miles. ‡—Cubic Yards. §—Lineal Feet. ¶—Blocks. ‖—Feet. ¹—Square Yards. For additional footnotes see page 121.

Table 2—Cost of Sand, Gravel and Crushed Stone

Name of City	Cost, delivered on the street, of: Sand	per	Gravel	per	Crushed stone	per
Alabama:						
Fairfield	3.25	cu. yd.	....	.....	2.30	ton
Gadsden	1.50-2.50	cu. yd.	....	.....	2.50	ton
Montgomery	.75	ton	1.20	ton	....	.....
Selma	1.00	yd.	.85	yd.	....	.....
Arizona:						
Globe	1.50	cu. yd.	1.50	cu. yd.	2.50	cu. yd.
Tucson	1.50	cu. yd	....	.....	3.00	cu. yd.
Arkansas:						
De Queen	....	.....	1.00	cu. yd.	....	.....
Fayetteville	2.80	cu. yd.	2.25	cu. yd.	3.25	cu. yd.
Helena	1.50	cu. yd.	2.00	cu. yd.	2.50	ton
Little Rock	2.50	cu. yd.	....	.....	1.75	ton
Texarkana	2.75	cu. yd.	3.20	cu. yd.	4.50	cu. yd.
California:						
Alameda	2.50	yd.	3.05	yd.	3.00	yd.
Calexico	4.00	yd.	3.75	yd.	....	.....
Eureka	1.75	cu. yd.	2.00	cu. yd.	....	.....
Los Angeles	1.50	ton	1.90	ton	2.00	ton
Napa	1.50	cu. yd.	2.00	cu. yd.	2.25	cu. yd.
Palo Alto	1.60	ton	1.60	ton	3.00	cu. yd.
Porterville	1.00	yd.	....	.....	2.20	yd.
San Bernardino	.75	cu. yd.	.75	cu. yd.	2.75	cu. yd.
San Francisco	1.50	cu. yd.	2.25	cu. yd.	2.25	cu. yd.
Santa Maria	1.20	yd.	2.00	ton	2.50	ton
So. Pasadena	1.75	yd.	2.00	yd.	3.00	yd.
Vallejo	3.75	cu. yd.	2.75	cu. yd.	2.75	cu. yd.
Whittier	2.25	ton	2.75	ton	3.00	ton
Colorado:						
Boulder	1.50	sq. yd.	1.50	sq. yd.	1.50	sq. yd.
Longmont	1.50	cu. yd.	1.50	cu. yd.	....	.....
Pueblo	1.25	cu. yd.	1.10	cu. yd.	2.10	cu. yd.
Salida	1.50	cu. yd.	1.50	cu. yd.	1.50	cu. yd.
Trinidad	3.50	cu. yd.	....	.....	3.00-3.50	cu. yd.
Connecticut:						
Bristol	.70	cu. yd.	1.00	cu. yd.	1.75	ton
Manchester	1.00	yd.	1.00	yd.	2.50	ton
Meriden	....	.....	....	.....	1.25-1.90	ton
New Britain	1.25	cu. yd.	....	.....	1.50	ton
New Haven	1.50	cu. yd.	.75	cu. yd.	1.80	cu. yd.
Norwich	2.00	cu. yd.	....	.....	3.00	cu. yd.
Putnam	1.50	yd.	1.50	yd.	2.25-3.00	ton
Rockville	1.65	yd.	1.65	yd.	2.20	ton
Willimantic	1.80	yd.	1.80	yd.	.75	yd.
Florida:						
Fort Lauerdale	1.25-1.35	cu. yd.	....	.....	1.75-1.95	cu. yd.
Fort Myers	1.50-2.50	cu. yd.	....	.....	3.50 & up	cu. yd.
Gainesville	2.00	cu. yd.	....	.....	6.00	cu. yd.
Sanford	2.10	ton	....	.....	2.75	ton
St. Augustine	2.00	cu. yd.	2.00	cu. yd.	3.75	cu. yd.
St. Petersburg	5.00	yd.	....	.....	6.00	yd.
Georgia:						
Athens	.50	cu. yd.	3.50	ton	4.00	ton
Columbus	1.00	cu. yd.	2.50	cu. yd.	3.25	cu. yd.
Griffin	1.10	cu. yd.	1.25	cu. yd.	1.25	cu. yd.
Rome	1.25	cu. yd.	1.50	cu. yd.	2.00	cu. yd.
Idaho:						
Boise	1.50	cu. yd.	2.00	cu. yd.	4.00	cu. yd.
Illinois:						
Beardstown	1.88	ton	1.88	ton	2.40	ton
Benton	1.90	ton	2.90	ton	2.40	ton
Bloomington	1.85	ton	1.85	ton	2.00	ton
Canton	1.50	ton	2.20	ton	3.00	ton
Centralia	2.26	ton	....	.....	2.36	ton
Louisiana:						
La Fayette	2.00	ton	3.50	ton	....	.....
Lake Charles	2.50	cu. yd.	4.00	cu. yd.	....	.....
Maine:						
Augusta	.25	l'd (abt. 1 yd.)	.15	yd.	.95	yd.
Portland	2.00	cu. yd.	2.00	cu. yd.	3.00	ton
Waterville	2.00	yd.	2.50	yd.	....	.....
Maryland:						
Frederick	3.00	ton	....	.....	2.95	ton
Massachusetts:						
Athol	1.20	sq. yd.	1.25	sq. yd.	1.50	sq. yd.
Brockton	2.50	yd.	2.50	yd.	3.25	ton
Cambridge	1.25	ton	2.00	ton	2.38	ton
Dartmouth	....	.....	....	.....	2.40	ton
Easthampton	....	.....	....	.....	2.85	ton
Holyoke	.75	yd.	....	.....	2.00	ton
Lawrence	2.25	cu. yd.	3.50	cu. yd.	1.30	ton
Pittsfield	1.60	cu. yd.	2.00	cu. yd.	2.70	ton
Provincetown	.60	ton	....	.....	4.00	ton
Quincy	4.00	cu. yd.	4.00	cu. yd.	2.10	ton
Springfield	2.00	yd.	3.00	yd.	2.20-1.85	ton
Webster	3.00	yd.	2.00	yd.	1.50	ton
Michigan:						
Alma	2.20	cu. yd.	2.40	cu. yd.	2.40	cu. yd.
Ann Arbor	1.50	cu. yd.	2.00	cu. yd.	....	.....
Detroit	2.30	cu. yd.	3.00	cu. yd.	3.00	ton
Dowagiac	1.50	yd.	1.50	sq. yd.	....	.....
Grand Rapids	.80	cu. yd.	1.20	cu. yd.	1.35	cu. yd.
Hastings	....	.....	1.00	yd.	....	.....
Highland Park	1.50	ton	2.50	ton	....	.....
Holland	.75	yd.	2.55	1½ yd.	....	.....
Ironwood	2.00	cu. yd.	....	.....	2.50	cu. yd.
Midland	2.25	cu. yd.	2.25	cu. yd.	....	.....
Niles	1.00-1.25	yd.	....	.....	....	.....
Owosso	2.50	load (1¼ yds.)	2.00	load	....	.....
Sault Ste. Marie	1.80	yd.	1.80	yd.	1.65-3.50	ton
Ypsilanti	1.00	cu. yd.	1.50	cu. yd.	3.00	ton
Minnesota:						
Albert Lea	1.50	cu. yd.	2.00	cu. yd.	....	.....
Chisholm	2.00	cu. yd.	....	.....	3.50	cu. yd.
Cloquet	2.00	cu. yd.	2.00	cu. yd.	....	.....
Crookston	1.75	yd.	3.00	yd.	4.25	yd.
Duluth	1.70	yd.	....	.....	2.00-4.00	yd.
Faribault	2.10	cu. yd.	3.10	cu. yd.	....	.....
Hibbing	1.20	sq. yd.	1.25	sq. yd.	3.00	sq. yd.
Minneapolis	1.75	cu. yd.	2.75	cu. yd.	2.75	cu. yd.
New Ulm	1.10-1.20	cu. yd.	.90	cu. yd.	....	.....
Red Wing	.35	.....	1.30	.....	....	.....
Rochester	1.20	yd.	3.05	cu. yd.	2.75	cu. yd.
St. Paul	1.25	cu. yd.	2.25	cu. yd.	2.25	cu. yd.
Two Harbors	1.30	cu. yd.	1.30	cu. yd.	1.90	cu. yd.
Willmer	1.25	yd.	2.75	yd.	3.50	yd.
Winona	1.50	cu. yd.	2.50	cu. yd.	....	.....
Mississippi:						
Clarksdale	3.00	cu. yd.	3.25	cu. yd.	3.50	cu. yd.
Greenwood	1.50	cu. yd.	2.25	cu. yd.	3.20	cu. yd.
Hattiesburg	1.75	cu. yd.	1.75	cu. yd.	....	.....
Natchez	2.00	cu. yd.	1.75	cu. yd.	4.50	ton
Missouri:						
Caruthersville	1.50	cu. yd.	1.75	cu. yd.	3.50	cu. yd.
Jefferson City	1.60	cu. yd.	3.00	cu. yd.	2.50	cu. yd.
Joplin	1.00	cu. yd.	1.00	cu. yd.	1.00	cu. yd.
Kansas City	2.50	cu. yd.	....	.....	2.60	cu. yd.
Poplar Bluff	2.00	yd.	2.25	yd.	3.00	yd.
Sedalia	2.00	cu. yd.	2.00	cu. yd.	3.50	cu. yd
Springfield	2.30	ton	2.20	ton	2.75	ton
St. Charles	2.50	cu. yd.	3.50	cu. yd.	1.90	ton
St. Louis	2.05	ton	2.15	ton	2.00	ton
Webster Grove	2.05	ton	2.00	ton	9.00	square
Montana:						
Havre	2.50	cu. yd.	2.50	cu. yd.	....	.....
Nebraska:						
Fremont	1.65	cu. yd.	2.00	cu. yd.	....	.....

Champaign	3.25	cu. yd.	3.25	cu. yd.	3.25	cu. yd.
Chicago	2.97	cu. yd.	2.97	cu. yd.	2.35	cu. yd.
Chicago Heights	2.50	cu. yd.	2.10	cu. yd.	2.10	cu. yd.
Danville	1.50	cu. yd.	1.70	ton	1.75	ton
Edwardsville	1.50	ton	2.00	ton	2.10	ton
East Moline	1.90	cu. yd.	2.50	cu. yd.	2.50	cu. yd.
Evanston	3.00	cu. yd.	3.00	cu. yd.	3.00	cu. yd.
Galena	2.25	cu. yd.	2.50	cu. yd.	....	.....
Jacksonville	1.40	ton	2.30	ton	2.40	ton
Joliet	2.25	cu. yd.	2.00	cu. yd.	2.00	cu. yd.
Kewanee	2.00	ton	2.55	ton	2.80	ton
La Grange	2.75	cu. yd.	2.50	cu. yd.	2.50	cu. yd.
Marion	2.60	ton	2.75	ton	2.50	ton
Mattoon	2.80	cu. yd.	3.10	cu. yd.	3.10	cu. yd.
Morrison	2.90	.....	2.90	.....	....	.....
Ottawa	2.75	cu. yd.	2.75	cu. yd.	3.00	cu. yd.
Peoria	1.70	ton	1.80	ton	3.25	ton
Quincy	2.00	cu. yd.	....	.....	2.25	ton
Streator	1.65	ton	1.65	ton	1.70	ton
Waukegan	3.50	cu. yd.	3.50	cu. yd.	3.50	cu. yd.
Wheaton	1.75	cu. yd.	1.75	cu. yd.	1.80	cu. yd.
Wilmette	2.75	cu. yd.	2.75	cu. yd.	2.75	cu. yd.
Indiana:						
Bloomington	2.00	yd.	2.00	yd.	1.85	yd.
Brazil	2.75	yd.	2.50	cu. yd.	3.00	cu. yd.
Covington	.50	yd.	.75	ton	2.50	ton
Crawfordsville	1.50	yd.	1.50	yd.	2.75	yd.
Elkhart	1.50	cu. yd.	2.00	cu. yd.	2.00	cu. yd.
Ellwood	3.00	cu. yd.	3.00	cu. yd.	3.00	cu. yd.
Fort Wayne	2.10	ton	2.48	ton	2.89	ton
Jasper	4.50	cu. yd.	4.35	cu. yd.	2.75	cu. yd.
Kendallville	1.25	cu. yd.	1.50	cu. yd.	....	.....
Lafayette	1.50	cu. yd.	1.50	cu. yd.	1.75	cu. yd.
La Porte	1.75	cu. yd.	3.50	cu. yd.	3.02	ton
Marion	1.50	yd.	1.50	yd.	2.25	.....
Mt. Vernon	1.12½	cu. yd.	1.12½	cu. yd.	....	.....
New Albany	1.60	ton	1.60	ton	2.15	ton
Noblesville	1.25	yd.	1.25	yd.	....	.....
North Vernon	2.00	cu. yd.	2.00	cu. yd.	2.00	cu. yd.
Peru	1.00	yd.	1.35	yd.	....	.....
Portland	1.50-1.75	cu. yd.	1.50	cu. yd.	2.00	ton
South Bend	2.25	cu. yd.	2.25	cu. yd.	2.25	ton
Wabash	1.50	cu. yd.	1.25-1.75	cu. yd.	.80-1.00	ton
West Lafayette	2.00	.....	1.50	.....	2.00	cu. yd.
Iowa:						
Boone	1.75	cu. yd.	1.75	cu. yd.	....	.....
Cedar Rapids	1.20	cu. yd.	4.00	cu. yd.	3.00	cu. yd.
Centerville	2.80	ton	....	.....	....	.....
Des Moines	2.25	cu. yd.	2.50	cu. yd.	3.75	cu. yd.
Emmetsburg	1.00	cu. yd.	1.00	cu. yd.	1.65	cu. yd.
Fort Dodge	2.00	yd.	2.00	yd.	2.50	yd.
Indianola	2.00-2.50	yd.	2.25-2.50	yd.	2.50-2.75	cu. yd.
Iowa City	1.30	ton	2.20	ton	1.90	ton
Keokuk	1.75	yd.	....	.....	2.10	cu. yd.
New Hampton	1.35	ton	1.65	ton	....	.....
Newton	1.40	ton	1.75	ton	....	.....
Oelwein	2.00	cu. yd.	2.00	cu. yd.	....	.....
Ottumwa	1.75	cu. yd.	3.00	cu. yd.	4.00	cu. yd.
Perry	1.50	yd.	1.75	yd.	2.50	yd.
Storm Lake	1.25	ton	1.25	ton	....	.....
Kansas:						
Atchison	2.00	yd.	....	.....	2.00	ton
Chanute	2.20	ton	....	.....	2.50	ton
Dodge City	1.50	cu. yd.	1.50	cu. yd.	....	.....
Emporia	3.50	cu. yd.	3.00	cu. yd.	5.00	cu. yd.
Hiawatha	2.40	ton	2.50	ton	2.50	ton
McPherson	3.50	ton	3.50	ton	3.85	ton
Parsons	.12	100 lbs.	....	.....	2.50	cu. yd.
Pratt	.70	cu. yd.	.70	cu. yd.	....	.....
Salina	2.00	yd.	....	.....	3.40	ton
Topeka	1.50	yd.	3.00	yd.	3.50	yd.
Wichita	1.25-1.50	cu. yd.	....	.....	....	.....
Kentucky:						
Ashland	2.50-3.75	cu. yd.	....	.....	....	.....
Covington	2.25	ton	2.50	ton	3.00	ton
Owensboro	1.10	yd.	1.10-1.37	cu. yd.	....	.....
Lexington	1.40	cu. yd.	1.75	cu. yd.	6.50	ton
Lincoln	1.10	ton	1.55	ton	2.00	ton
Omaha	1.88	ton	2.85	ton	3.45	ton
Scottsbluff	1.00	sq. yd.	1.50	sq. yd.	....	.....
Nevada:						
Reno	1.50	cu. yd.	....	.....	2.75	cu. yd.
Winnemucca	1.50	cu. yd.	1.50	cu. yd.	....	.....
New Jersey:						
Bayonne	2.85	cu. yd.	3.50	cu. yd.	3.75	cu. yd.
East Orange	3.00	ton	....	.....	....	.....
Englewood	2.50	yd.	....	.....	3.10	yd.
Fort Lee	4.25	cu. yd.	....	.....	4.25	cu. yd.
Freehold	2.50	ton	2.50	ton	3.75	ton
Garfield	1.75	cu. yd.	....	.....	3.50	cu. yd.
Irvington	2.40	.....	....	.....	3.00	cu. yd.
Millville	1.70	ton	2.80	ton	....	.....
Montclair	3.00	ton	....	.....	2.65-3.25	ton
Newark	....	.....	....	.....	3.65	cu. yd.
Newton	.90	ton	.30	ton	2.00	ton
Nutley	2.00	ton	3.00	ton	2.75	ton
Phillipsburg	2.20	ton	2.40	ton	2.40	ton
Summit	2.15-3.25	cu. yd.	2.00-3.00	cu. yd.	3.40-4.80	cu. yd.
New York:						
Albany	1.96	cu. yd.	2.20	cu. yd.	3.10	cu. yd.
Binghamton	2.50	cu. yd.	2.25	cu. yd.	2.25	ton
Buffalo	1.50-2.10	ton	1.25-1.85	ton	2.25	cu. yd.
Corning	2.00	cu. yd.	2.25	cu. yd.	2.83-3.44	cu. yd.
Dansville	1.75	yd.	2.00	yd.	2.25	yd.
Fairport	2.00	cu. yd.	2.00	cu. yd.	2.50	cu. yd.
Fulton	1.75	cu. yd.	1.75	cu. yd.	1.65	ton
Geneva	2.50	ton	2.50	ton	2.50	ton
Glen Falls	1.50-2.00	cu. yd.	1.50-2.00	cu. yd.	2.50	ton
Gloversville	1.75-2.00	(ld.1½yds.)	1.75-2.00	load	3.00	cu. yd.
Gouverneur	1.50	cu. yd.	2.00	cu. yd.	2.50	cu. yd.
Haverstraw	1.50	cu. yd.	....	.....	3.80	cu. yd.
Herkimer	1.25	yd.	1.25	yd.	3.00	yd.
Hornell	2.00	yd.	2.00	yd.	....	.....
Hudson	2.75	sq. yd.	2.75	sq. yd.	2.50	sq. yd.
Lackawanna	2.50	yd.	....	.....	2.00	yd.
Little Falls	2.50	ton	....	.....	2.50	ton
Lockport	2.85	cu. yd.	3.00	cu. yd.	3.00	cu. yd.
Middletown	2.00	yd.	2.00	yd.	....	.....
New York—						
Brooklyn Boro	1.29	cu. yd.	2.64	cu. yd.	2.19	cu. yd.
Bronx Boro	1.85	cu. yd.	2.70	.....	2.85	.....
Queens Boro	1.57	cu. yd.	....	.....	3.09	cu. yd.
Richmond Boro	2.75	cu. yd.	....	.....	....	.....
Olean	2.50-3.00	cu. yd.	2.50	cu. yd.	....	.....
Oneida	2.50	cu. yd.	2.50	cu. yd.	2.80	cu. yd.
Oneonta	1.65-2.70	.....	1.50	cu. yd.	2.35	yd.
Plattsburgh	1.00	cu. yd.	1.00	cu. yd.	2.25	ton
Port Chester	3.25	cu. yd.	....	.....	4.50	.....
Port Jervis	1.50	cu. yd.	....	.....	3.50	cu. yd.
Poughkeepsie	3.00	cu. yd.	2.80	cu. yd.	3.00	cu. yd.
Rochester	2.67	cu. yd.	2.67	cu. yd.	2.00	cu. yd.
Schenectady	2.00	cu. yd.	....	.....	3.00	cu. yd.
Watertown	1.00	cu. yd.	1.00	cu. yd.	3.00	cu. yd.
North Carolina:						
Asheville	1.50	.....	....	.....	4.50	yd.
Concord	1.50	yd.	2.05	ton	2.05	ton
Greensboro	1.50	yd.	3.50	cu. yd.	3.50	cu. yd.
Marion	2.00	ton	....	.....	5.00	ton
Mount Airy	....	.....	....	.....	.00-3.50	ton
Wilson	2.00	yd.	....	.....	4.00	yd.
North Dakota:						
Dickinson	3.50	cu. yd.	3.75	cu. yd.	...	.....
Fargo	4.30	cu. yd.	4.20	cu. yd.	4.50	ton
Mandan	2.05	cu. yd.	2.95	cu. yd.	....	.....
Ohio:						
Akron	1.65	ton	2.24	ton	2.65	ton
Alliance	....	.....	2.90	ton	2.75	ton
Ashtabula	2.50	cu. yd.	2.50	cu. yd.	3.50	ton
Barnesville	2.50	cu. yd.	4.00	cu. yd.	6.00	cu. yd.
Bucyrus	1.40	ton	....	.....	1.85	ton
Cleveland	2.25	cu. yd.	2.50	cu. yd.	....	.....
Delaware	.15	bushel	....	.....	2.25	ton
Fremont	1.65	cu. yd.	2.00	cu. yd.	....	.....

Name of City	Cost, delivered on the street, of Sand	per	Gravel	per	Crushed stone	per
Ohio (Continued)						
East Palestine	3.25	ton	3.25	ton	3.00	ton
Fostoria	2.00	ton	2.00	ton	1.80	ton
Fremont	1.60	ton	....	.....	1.60	ton
Hillsboro	1.70	ton	1.70	ton	1.80	ton
Jackson	1.75	ton	1.75	ton	2.00	ton
Lakewood	2.25	ton	....	.....	2.75	ton
Lancaster	2.50	cu. yd.	1.25	cu. yd.	2.75	cu. yd.
Lawton	1.00	cu. yd.	1.20	cu. yd.	2.85	ton
Lima	3.00	cu. yd.	....	.....	2.00	cu. yd.
London	2.00	cu. yd.	2.00	cu. yd.	2.25	ton
Marysville	2.00	ton	1.50	ton	1.80	ton
Middletown	1.25	cu. yd.	1.25	cu. yd.	2.35	ton
Mt. Vernon	1.25	yd.	.75	yd.	2.00	yd.
Nelsonville	2.00-2.50	cu. yd.	2.00-2.50	cu. yd.	....	.....
New Boston	2.00	cu. yd.	2.00	cu. yd.	....	.....
Niles	2.20	cu. yd.	....	.....	2.00	cu. yd.
Oberlin	2.23	ton	2.23	ton	....	.....
Salem	2.00	ton	1.75	ton	....	.....
Toledo	2.25	ton	2.25	ton	3.00	ton
Urbana	1.50	cu. yd.	1.00	cu. yd.	....	.....
West Park	3.00	yd.	3.00	yd.	2.25	yd.
Wooster	2.50	yd.	2.50	yd.	3.25	yd.
Zanesville	2.50	ton	2.50	ton	3.50	ton
Oklahoma:						
Ada	2.25	cu. yd.	2.50	cu. yd.	2.60	cu. yd.
Hugo	2.50	cu. yd.	2.50	cu. yd.	2.00	cu. yd.
McAlister	3.50	cu. yd.	3.75	cu. yd.	4.50	cu. yd.
Sapulpa	1.75	yd.	1.65	yd.	1.85	yd.
Shawnee	2.00	cu. yd.	....	.....	2.40	ton
Oregon:						
Astoria	2.25	yd.	3.00-4.00	yd.	2.75-3.50	yd.
Baker	1.75	.....	1.50	cu. yd.	....	.....
Eugene	2.00	cu. yd.	1.75	cu. yd.	1.75	cu. yd.
Klamath Falls	2.75	cu. yd.	....	.....	2.75	cu. yd.
La Grande	1.75	cu. yd.	1.50	cu. yd.	2.25	cu. yd.
Oregon City	1.75	cu. yd.	1.75	cu. yd.	3.00	cu. yd.
Portland	1.10	cu. yd.	1.15	cu. yd.	1.90	cu. yd.
Pennsylvania:						
Ashley	3.75	ton	3.50	ton	4.50	ton
Beaver Falls	2.30	ton	1.85	ton	2.50	ton
Berwick	1.75	cu. yd.	1.75	cu. yd.	2.25	ton
Carrick	.15	bushel	.17	bushel	....	.....
Clearfield	3.50	ton	4.00	ton	3.50	ton
Du Bois	3.50	ton	....	.....	....	.....
Duquesne	2.00	ton	2.00	ton	....	.....
Farrell	2.75	ton	2.50	ton	....	.....
Franklin	2.50	yd.	2.00	yd.	....	.....
Freeland	3.00	ton	2.86	ton	3.25	ton
Greenville	2.75	ton	2.55	ton	....	.....
Hazleton	2.90	ton	3.20	ton	3.75	ton
Huntingdon	1.90	ton	....	.....	2.50	ton
Kingston	2.25-2.50	ton	2.25-2.50	ton	2.50-2.75	ton
Lebanon	2.50	ton	....	.....	2.00	ton
Monongahela	.18	100 lbs.	.16	100 lbs.	....	.....
Munhall	2.15	ton	1.95	ton	....	.....
Norristown	2.50	cu. yd.	....	.....	2.50	ton
Oil City	3.00	cu. yd.	3.00	cu. yd.	....	.....
Parkesburg	....	.....	....	.....	3.00	ton
Pittsburgh	1.25	ton	1.35	ton	....	.....
Pottsville	....	.....	....	.....	2.75	ton
Rankin	2.40	ton	2.20	ton	....	.....
Sewickley	2.50	ton	2.50	ton	4.00	ton
Shippensburg	1.50	ton	2.00	ton	2.50	ton
St. Marys	2.70	ton	....	.....	2.70	ton
Tyrone	3.25	ton	....	.....	3.50	ton
Uniontown	.25	bushel	2.50	ton	2.70	ton
West Homestead	....	.....	....	.....	5.00	ton
Wilkes-Barre	1.75	cu. yd.	1.75	cu. yd.	1.75	cu. yd.
Williamsport	2.25	cu. yd.	2.65	cu. yd.	2.50	cu. yd.
York	....	.....	....	.....	1.30	ton
Rhode Island:						
Pawtucket	....	.....	....	.....	2.75	ton
Westerly	....	.....	.90	ton	2.10	ton
Woonsocket	1.25	load (abt. 1 cu. yd.)	1.50	load	3.25-3.75	ton

Name of City	Cost, delivered on the street, of Sand	per	Gravel	per	Crushed stone	per
South Carolina:						
Charleston	1.50	cu. yd.	....	.....	3.30	cu. yd.
Columbia	1.00	cu. yd.	....	.....	2.00	ton
Greenville	1.25	yd.	5.00	yd.	2.80	yd.
Spartanburg	1.25	yd.	....	.....	3.50	ton
South Dakota:						
Mitchell	1.50	yd.	....	.....	3.00	ton
Tennessee:						
Clarksville	3.00	yd.	2.50	yd.	2.00	yd.
Cleveland	3.00	ton	3.00	ton	3.50	ton
Jackson	1.10	cu. yd.	2.00	ton	2.00	ton
Texas:						
Amarillo	2.75	yd.	2.25	yd.	....	.....
Beaumont	1.50	cu. yd.	4.25	cu. yd.	....	.....
Bonham	2.05	cu. yd.	2.55	cu. yd.	4.00	cu. yd.
Cameron	4.00	cu. yd.	1.75	cu. yd.	3.80	cu. yd.
Cisco	3.10	cu. yd.	....	.....	3.00	cu. yd.
Dallas	2.50	cu. yd.	2.50	cu. yd.	2.15	cu. yd.
Denton	3.00	cu. yd.	3.00	cu. yd.	3.50	cu. yd.
Eastland	3.50	cu. yd.	3.50	cu. yd.	3.25	cu. yd.
Fort Worth	3.00	cu. yd.	2.75	cu. yd.	3.75	cu. yd.
Mineral Wells	2.50	ton	....	.....	2.80	ton
Texarkana	2.00	yd.	3.00	yd.	....	.....
Waxahachie	2.50-3.50	cu. yd.	3.00-3.50	cu. yd.	....	.....
Wichita Falls	3.75	cu. yd.	3.75	cu. yd.	4.00	cu. yd.
Utah:						
Logan	2.00	cu. yd.	2.00	cu. yd.	2.00	cu. yd.
Vermont:						
Barre	2.00-3.00	truck & team loads.	Same as sand		2.00	ton
Rutland	1.70	cu. yd.	1.00	cu. yd.	1.50	cu. yd.
Springfield	1.00	cu. yd.	1.25	cu. yd.	3.50	cu. yd.
Virginia:						
Charlottesville	1.50	yd.	....	.....	2.30	yd. or ton
Danville	.60	yd.	....	.....	3.50	cu. yd.
Fredericksburg	1.00	cu. yd.	2.00	cu. yd.	....	.....
Newport News	2.00	cu. yd.	2.50	ton	3.10	ton
Norfolk	1.40	ton	2.40	ton	3.00	ton
Petersburg	.75	ton	1.25	ton	3.50	ton
Pulaski	2.00	cu. yd.	....	.....	2.50	cu. yd.
Salem	2.00	cu. yd.	2.00	cu. yd.	3.65	cu. yd.
Suffolk	1.90	ton	2.40	ton	....	.....
Washington:						
Bellingham	2.50	cu. yd.	2.50	cu. yd.	....	.....
Chehalis	1.90	cu. yd.	1.90	cu. yd.	2.25	cu. yd.
Dayton	2.70	cu. yd.	1.20	cu. yd.	1.90	cu. yd.
Okanogan	1.00	cu. yd.	1.75	yd.	2.00	yd.
Puyallup	2.75	cu. yd.	2.25	cu. yd.	....	.....
Raymond	3.70	cu. yd.	3.70	cu. yd.	....	.....
Seattle	1.75-2.25	cu. yd.	1.75-2.25	cu. yd.	....	.....
W. Virginia:						
Bluefield	3.50	cu. yd.	3.50	cu. yd.	3.50	cu. yd.
Fairmont	3.00	ton	3.50	ton	....	.....
Parkesburg	2.00	cu. yd.	2.00	cu. yd.	3.00	ton
Wheeling	1.40	ton	1.20	ton	....	.....
Wisconsin:						
Appleton	1.85	ton	1.50	cu. yd.	2.60	ton
Delavan	3.00	cu. yd.	2.60	ton	....	.....
De Pere	1.25	yd.	2.50	yd.	2.50	yd.
Fond du Lac	2.75	yd.	2.80	.....	3.00	.....
Green Bay	2.50	cu. yd.	3.00	cu. yd.	3.25	cu. yd.
Kaukauna	2.75	cu. yd.	2.50	ton	2.50	cu. yd.
Lake Geneva	1.50	yd.	1.25	yd.	2.00	yd.
Madison	1.90	ton	2.15	ton	....	.....
Manitowoc	....	.....	1.55	ton	1.55	ton
Marshfield	3.50	cu. yd.	4.60	cu. yd.	4.90	cu. yd.
Milwaukee	2.10	ton	2.40	ton	2.40	ton
Oshkosh	2.00	cu. yd.	2.40	cu. yd.	2.40	cu. yd.
Sheboygan	1.50	ton	1.50	ton	1.40	ton
Superior	1.25	cu. yd.	1.75	cu. yd.	2.00	ton
Waukesha	1.50	yd.	1.60	ton	1.60	ton
Wausau	2.00	cu. yd.	2.00	cu. yd.	3.50	cu. yd.
Wisconsin Rapids	2.37	cu. yd.	2.98	cu. yd.	3.50	cu. yd.
Wyoming:						
Casper	....	.....	2.00-2.50	yd.	....	.....
Sheridan	2.50	yd.	2.50	yd.	2.50	yd.

Table No. 3—Methods of Paying for Paving

Name of City	Percentage of Paving Cost: Assessed on abutting property.	Percentage of Paving Cost: Paid in city.	Method of Calculating Assessments	Payable in how many instalments.	Funds obtained by city by	Life of bonds, years.
Alabama:						
Bessemer	.....	⅓	By front foot.	10	bonds	10
Fairfield	all	.....	By front foot.	10	.....	10
Gadsden	all	.....	By front foot, inersections by city.	10	bonds	10
Montgomery	all	.....	By front foot, intersections by property owners.	10 & 20	bonds	10 & 20
Selma	all	.....	By front foot.	10	bonds	10
Troy	⅔	⅓	By front foot.	10	bonds	10
Arizona:						
Globe	.....	33⅓%	By front foot, intersections by city.	10	budget	10
Tucson	all	.....	By front foot, excl. intersections.	10	budget	10
Arkansas:						
De Queen	.....	all	By cubic yard.	..	annual budget	..
Fayetteville	.....	.....	50% assessed value, 50% front ft.	1	city warrants	10
Helena	75%	25%	Benefits—front foot.	10-20	budget	10-20
Little Rock	all	.....	By front foot.	10	.....	..
Pine Bluff	all	.....	By front foot, incl. intersections.	..	.....	..
California:						
Alameda	all	special cases	By area.	..	budget	..
Calexico	all	.....	Various methods.	10	budget or bonds	10
Eureka	all	.....	By paving districts, incl. intersections.	9 or 14	annual budget	..
Los Angeles	all	.....	By front foot.	10	.....	..
Napa	asph. mac. 100% conc., 65%	35%	By front foot, intersections by property owners.	5	annual budget	..
Palo Alto	all	.....	By front foot.	cash	annual budget	..
Porterville	all	.....	By front foot, area of lot.	10	budget	10
Redlands	all	.....	.....	10	.....	10
San Bernardino	all	.....	By front foot, incl. intersections.	9	.....	10
San Francisco	all	.....	Front ft. or sq. ft. on special projects.	10	budget	10
Santa Maria	.....	.....	By assessment districts, intersections included.	1	budget	..
So. Pasadena	all	.....	Area (district plan).	10	.....	10
Vallejo	all	.....	Front foot and area.	10	.....	9
Whittier	all	.....	Front foot.	10	.....	10
Colorado:						
Boulder	all	.....	(See note.)	15	.....	15
Longmont	all	.....	By front foot, excl. intersections.	10	budget	10
Pueblo	all	.....	(See note.)	2	bonds	20
Trinidad	all	.....	By front foot, intersections to 4 half blocks.	20	bonds	20
Connecticut:						
Bristol	⅓	⅔	By value of lot.	2	budget	..
Hartford	½	½	By front foot.	1	budget	..
Manchester	.....	all	.....	..	.....	..
Meriden	½	½	By front ft., intersections by city.	3	bonds	partial maturity each year.
New Britain	all	.....	By front foot.	1	budget	..
New Haven	.....	.....	Flat rate per front ft. (see note).	2	bonds	20
Norwich	.....	all	.....	..	bond	30
Putnam	.....	all	.....	..	budget & notes	..
Rockville	⅔	⅓	Only on sidewalks—as taxes.	..	budget	..
Stratford	.....	.....	.....	..	budget	..
Willimantic	.....	.....	.....	..	budget	..
Florida:						
Fort Lauerdale	all	.....	By front ft., intersections by city.	1-10	bonds	20
Fort Myers	9/10	1/10	Area, intersections by city.	5	bonds	5
Gainesville	⅔	⅓	Front ft., incl. intersections.	3	bonds	25-30
Sanford	⅔	⅓	By front foot.	1-10	bonds & budget	30
St. Augustine	⅔	⅓	By front foot.	30 days after is complete.	.....	..
St. Petersburg	all	.....	By front ft., incl. intersections.	5	.....	..
Georgia:						
Athens	¼	¾	Front foot.	1	bonds	30
Columbus	⅔	⅓	By front ft., intersections by city.	1	both	30
Griffin	⅔	⅓	Front ft., intersections pro-rated.	5	bonds	5-6
Rome	⅔	⅓	By front foot.	4	budget	..
Idaho:						
Boise	all	.....	By front ft., intersections by city.	10	bonds or budget	10
Illinois:						
Beardstown	all	.....	By front ft., intersections by city.	10	bonds	10
Benton	all	.....	By front ft., intersections pro-rated.	10	.....	10
Bloomington	all	.....	Benefits on front ft. basis, intersections by city.	10	budget	10
Canton	75%	25%	By front foot.	10	budget & bonds	10
Centralia	all	.....	Special benefits.	10	.....	10
Champaign	all	.....	(See note.)	10	budget	2-10
Chicago	all	none	By front ft.; or for ½ block each side of street. (See notes.)	..	.....	..
Chicago Heights	all	.....	By area of pavement.	10	budget	..
Collinsville	.....	.....	Front foot.	..	.....	..
Danville	.....	.....	Unusually front foot.	10	budget	10
Edwardsville	95%	5%	Front ft. mostly—area partly.	10-5	item for permanent impvs.	10-5
East Moline	all	.....	Front ft., with exceptions in regard to benefits.	7-10	.....	7-10
Evanston	all	.....	By front foot.	1-10	.....	..
Galena	.....	.....	Varied—by front foot.	10	cash—bonds	10
Jacksonville	all	.....	By front ft. Special tax.	10	sometimes public benefit tax.	10
Joliet	95%	5%	Front foot.	10	budget	2-10
Kewanee	90%	10%	By front ft. of lots for 90% of total cost.	10	bonds—special assessment.	1-10
La Grange	all	.....	Front foot.	10	.....	..
Litchfield	all	.....	Front foot.	10	.....	..

To be continued

NEWS OF THE SOCIETIES

CALENDAR

Feb. 20-23—NATIONAL ASSOCIATION OF BUILDERS' EXCHANGES. Annual meeting. Hotel Chisca, Memphis, Tenn.

Feb. 20-23—AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. Engineering Societies Bldg., New York City. Secretary, F. F. Sharpless, 29 W. 39th st., New York City.

Feb. 21-22—KENTUCKY ASSOCIATION OF HIGHWAY CONTRACTORS. Annual meeting. Louisville. Secretary, D. R. Lyman, 523 Court Place, Louisville, Ky.

Feb. 21-23—MINNESOTA FEDERATION OF ARCHITECTS AND THE MINNESOTA SOCIETY OF CIVIL ENGINEERS. First annual convention. Curtis Hotel, Minneapolis.

Feb. 22—AMERICAN ASSOCIATION OF ENGINEERS. Conference of practicing engineers. Congress Hotel, Chicago.

Feb. 22—AMERICAN BUILDING EXPOSITION. Municipal Auditorium, Cleveland, Ohio.

Feb. 24-25—ENGINEERING SOCIETY OF WISCONSIN. Annual meeting. Madison. Secretary—L. E. Smith, Madison.

Mar. 14-16—AMERICAN RAILWAY ENGINEERING ASSOCIATION. Annual convention. Chicago, Ill.

Mar. 15—NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies Bldg., New York City.

Mar. 18—ROCHESTER ENGINEERING SOCIETY. Quarter-centennial dinner.

Mar. 23-24—ILLINOIS SECTION, AMERICAN WATER WORKS ASSOCIATION. Fourteenth annual meeting. Urbana, Ill.

Apr. 19-21—TRI-STATE WATER AND LIGHT ASSOCIATION OF THE CAROLINAS AND GEORGIA. Spartanburg, S. C.

Apr. 27-30—BUILDING OFFICIALS' CONFERENCE. Apr. 27-28, Cleveland, O.; Apr. 29, Massillon, O.; Apr. 30, Youngstown, O.

May 15-19—AMERICAN WATERWORKS ASSOCIATION. Annual convention. Philadelphia, Pa.

June 4-6—AMERICAN ASSOCIATION OF ENGINEERS. 8th Annual Convention. Salt Lake City, Utah.

SOCIETY OF INDUSTRIAL ENGINEERS

The Society of Industrial Engineers held a meeting on February 14th at the Auditorium Hotel, Chicago. This was the second meeting in the Chicago chapter series on "Stabilization of Industry," and the subject was "The Wastes of Uneven Production." Addresses by a general manager, a works manager or industrial engineer, and a labor leader or economist.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

The 125th meeting of the American Institute of Mining and Metallurgical Engineers was held at the Engineering Societies Building, New York City, on February 20-23. This included sessions on Mining Methods, Industrial Relations, Safety, Non-Metallic, Iron and Steel, and Mining, also meetings of Institute of Metals division. The social features of the meeting consisted of the annual banquet, special excursions and entertainments.

PRACTICING ENGINEERS

The First Annual Conference of Practicing Engineers will be held at Congress Hotel, Chicago, February Twenty-second, 1922, under direction of Committee on Services and Fees for Practicing Engineers, American Association of Engineers.

The purpose of this conference is to discuss problems of service, fees, office procedure, professional relations and business methods to promote more uniform practice in the profession, higher ethical standards, and a better understanding among practicing engineers of the common problems peculiar to their work and to their relation with the public. Ample time will be provided for a full discussion of the papers presented.

The conference is open to all practicing engineers in every branch of the profession. A particular invitation is extended to mechanical, electrical and chemical engineers. Registration will begin at 9:00 a. m. Wednesday, February 22nd, in the Green Room of the Congress Hotel.

Program: "Publicity for Practicing Engineers," M. W. Lee; "How to Uphold the Standards of Services and Fees," Gardner S. Williams; "Experiences of the Practicing Engineer with Licensing," C. S. Hammatt; "How to Sell Engineering Services," Paul E. Green; "Cost Accounting for Engineering Services," Arthur L. Mullergren; "Computing the Practicing Engineer's Income Tax," Clarence W. Hubbell.

TOUR OF PRESIDENT COOLEY

President Cooley has arranged the following tour in the interests of the Federated American Engineering Societies: Feb. 6-10, Engineers' Club of Kansas City, Mo., University of Kansas, Kansas Engineering Society, Oklahoma City engineers, Oklahoma University at Norman; February 15, Southern Methodist University and the Technical Club of Dallas, University of Texas and the Engineering Faculty of the University; February 16, Agricultural and Mechanical College of Texas; February 17, Houston Engineers' Club; February 20, Louisiana Engineering Society and Tulane University, and the State University at Baton Rouge; February 25, the Affiliated Technical Societies of the City of Atlanta; March 1, Georgia School of Technology at Athens; March 3, Alabama Technical Association in Birmingham; March 6, Engineers' Association of Nashville, and March 7, Architects' Club of Louisville and Lexington University.

IDAHO ENGINEERS AND ARCHITECTS MEET

Three organizations of technical men of Idaho—the Idaho Society of Architects, the Idaho chapter of the A.A.E. and the Idaho Irrigation Congress—met in joint session on January 16-21 at Rupert. The relation of architecture to engineering, city planning, the state building code, the unemployment situation, utilities valuation, government regulation of railroads, mining engineering methods and a review of the value and extent of the phosphate resources of Idaho were the main topics of discussion. Irrigation bills were endorsed.

Officers elected to head the A.A.E. were as follows: president, E. E. Moberly; vice-presidents, J. E. Wilson and S. T. Baer; secretary-treasurer, E. F. Ayers.

MISSISSIPPI VALLEY OFFICIALS HIGHWAY ASSOCIATION

At the meeting of the Mississippi Valley Officials Highway Association at Decatur, Ill., on January 22nd, F. R. White, of Ames, Iowa, was elected president and M. W. Watson of Topeka, Kans., secretary.

ENGINEERS' CLUB OF MINNEAPOLIS

Walter H. Wheeler, consulting engineer of Minneapolis, was elected president of this club, W. P. Ryan of the department of engineering, University of Minnesota, was elected vice president; A. F. Mellen was chosen secretary and O. F. Moore, treasurer.

TOPEKA ENGINEERS CLUB

The annual meeting and banquet of the Topeka Engineers' Club was held on January 24th. Officers were elected for 1922 as follows: President, A. B. Griggs; first vice-president, Ray Finney; secretary, W. L. Lammers and treasurer, C. A. Funchess.

ENGINEERING SOCIETY OF BUFFALO

A meeting of the Engineering Society of Buffalo was held at the Iroquois Hotel, Buffalo, on February 14th which was addressed by Ralph H. McKee, professor of chemical engineering, Columbia University, on "Gasoline from Oil Shale."

MOHAWK VALLEY ENGINEERS' CLUB

A meeting of the Mohawk Valley Engineers' Club was held on February 2nd, which was addressed by Calvin W. Rice, secretary of the American Society of Mechanical Engineers; by B. R. Cummings, engineer of the radio department, General Electric Company, who demonstrated by actual working apparatus in receiving and sending wireless phone messages the principles of the wireless; and by Mr. O'Connor of the J. & M. Electric Company.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

THE AULTMAN TAYLOR COMPANY'S TRUSTY TRACTOR

ROAD BUILDING TRACTORS

The kerosene and gasoline tractors, manufactured by the Aultman-Taylor Machinery Co., are designed for hauling road making and maintaining machinery, and are built in three sizes, the Faithful, which will handle an 8-foot blade grader, the Sturdy to haul a 10 or 12-foot grader and the Trusty for the heaviest service, including the simultaneous hauling of two 12-foot blade graders. They are all equipped with 4-cylinder engines and at normal motor speed have road speeds varying from 2.13 to 2.93 miles per hour. They are strong and durable and some of them have been in use for 10 years and are still serviceable and satisfactory. The machines have been purchased by more than 500 townships in 17 states and in Canada.

The makers claim that the use of tractors save from 50 to 75 per cent. of road building cost and build double the number of miles in the same length of time and build them better. In support of these claims a number of testimonials are published, making various statements concerning the efficiency and economy of the work. In Schuyler, Nebraska, a tractor hauling a 12-foot blade grader used 55 gallons of gasoline and 4 gallons of lubricating oil in 14 hours. A tractor in Seward County, Nebraska, graded 35½ miles of road at an average total cost of $35.00 per mile. In Newhall, Iowa, a Trusty tractor uses about 40 gallons of kerosene and 5 gallons of gasoline per 10-hour day, pulling a 12-foot Adams grader.

In Oskaloosa, Kansas, the tractor averaged 1¼ miles per day, using 25 gallons of gasoline and 3½ gallons of oil in 10 hours and doing work at an estimated cost of from 1/3 to 1/10 of the cost of the same work done with teams. In one case a mile of road, involving considerable gumbo, was built in one afternoon under circumstances where more than 20 good teams would have been required without the tractor.

THE WINNER HIGHWAY PATROL

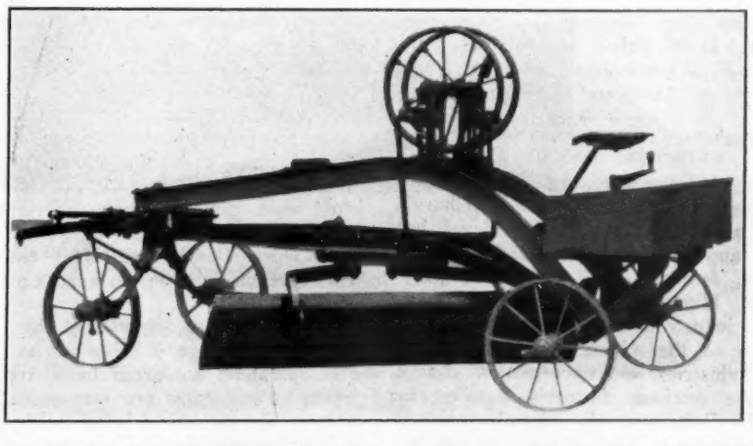
This machine has interchangeable and malleable iron parts strong enough to endure the strain from a small tractor, although intended for service as a two-horse grader. The wheels have concave treads to prevent slipping and the hubs are fitted with dust-proof boxes and oil cups.

The adjustments are simple, quick and powerful, and are easily made by the operator without changing his position.

The blade is raised and lowered by means of hand wheels operating in connection with a worm and gear mechanism. By simply releasing a bolt held in place with a spring, the blade can be reversed to any angle, or all the way round. The blade when set to an angle of 45 degrees, can be shifted laterally two feet outside the line of the wheels. This lateral shift is controlled by means of a screw and bevel gearing. By simply removing three bolts the blade can be inclined backward and forward to suit the varying conditions of the soil.

In any kind of work, such as plowing, cutting down banks, or moving earth, the machine can be operated by one man and two horses, thus building and maintaining a road at a very low cost.

The machine has a 6-foot blade, 8-foot wheelbase, 35 degree range of tilt adjustment, 16-inch vertical adjustment, and weighs 1,150 pounds. It is manufactured by the Good Roads' Machinery Co., Inc.



GOOD ROADS MACHINERY CO'S WINNER HIGHWAY PATROL

PERSONALS

Craven, Walter S., has been appointed city engineer of Ogden, Utah.

Jackson, William T., has been appointed director of public service of Toledo, Ohio.

Hill, Robert Clark, acting county engineer of Sussex County, Del., has been elected engineer for 1922.

Roberts, Arthur B., of Cleveland, Ohio, has been appointed director of public works by Mayor Kohler.

Earle, David M., city engineer of Worcester, Mass., has been reappointed by the common council.

Halcott, George C., who for many years has been superintendent of public buildings of Worcester, Mass., has been re-elected by the common council.

Davis, B. H., city engineer of Iowa City, Ia., has been reappointed for one year.

Gibbony, Frank L., formerly city engineer of Roanoke, Va., died recently in Charlotte, N. C.

INDUSTRIAL NOTES

The Dayton-Dowd Co. of Quincy, Ill., has opened a district office at Pittsburgh, Pa., at 809 Keenan Bldg., covering the sale of that company's centrifugal pumps and underwriters' pumps. This office will be in charge of T. J. Barry, who for the past several years has been connected with the home office of the company.

The Milwaukee Tank Works, Milwaukee, Wis., has opened a branch factory at San Francisco, Cal., to expedite the shipment of the company's equipment to the Pacific coast states. Mr. R. W. Johnstone is manager of the branch.

The Bucyrus Co., South Milwaukee, Wis., announces the appointment of A. R. Hance as sales manager with the Northwestern sales office of this company at 608 Pittock Block, Portland, Ore., to succeed L. T. Russell, who resigned after ten years' service.

The Parsons Co., manufacturers of trench excavating machinery, has established a branch office at 510 Railway Exchange Bldg., Kansas City, Mo., with J. E. Demuth as district manager in charge of the office. Agencies have also been established with Fred S. Sawyer, 2220 Market street, Philadelphia, Pa., and with F. S. Truex, manager of the Atlanta Machinery Co., Atlanta, Ga.

D. B. Frisbie of Atlanta, Ga., has been given the responsibility of developing a large selling organization throughout the south for the Barber-Greene Co., of Aurora, Ill. The following southern sales organizations are under his direction: General Utilities Co., Norfolk, Va.; Standard Equipment and Machinery Co., Spartanburg, S. C.; A. B. Moore, Jr., Savannah, Ga.; Alabama Machinery & Supply Co., Montgomery, Ala.; J. D. Turner Co., Birmingham, Ala.; Wilson, Weesner & Co., Nashville, Tenn.; Dealers Coal Mining Co., Nashville, Tenn.; E. W. Price, Tampa, Fla.; Higgins & Wormington, New Orleans, La., A. M. Lockett Co., New Orleans,

CHANGES OF WESTINGHOUSE ELECTRIC PERSONNEL

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces that T. H. Hayes has been appointed manager of the Indianapolis, Indiana, office of the company. A. E. Hitchner, assistant to the manager, industrial department, in general charge of the mining and electro-chemical industries, will have general charge of the sections, formerly handled by W. H. Patterson, who recently resigned as assistant to the manager of the industrial department to accept the position of vice president of the Kaestner & Hecht Company, Chicago, elevator manufacturers, who handle Westinghouse direct traction elevator equipment in the Middle West.

HOLT ROAD TRACTOR EXHIBIT

At the National Good Roads Show in Chicago, January 17-20, the exhibit of The Holt Manufacturing Co. represented the manner in which "Caterpillar" tractors with especially designed equipment eliminates horses and mules in road work. The Holt exhibit, occupying 2,000 square feet in the main building, comprised a complete line of "Caterpillars." A 10-ton, with left-hand drive, was hitched to the largest sized Russell Elevating Grader, and alongside of it was a 5-ton hitched to a six-yard La-Plant-Choate Dump Wagon, representing a complete unit in a motorized outfit. Visitors at the show had a visual demonstration of this new method by means of the "Caterpillar" motion pictures which were constantly shown on a large elevated screen at the end of the Holt exhibit.

One the 5-ton was also mounted a "Caterpillar" bulldozer, used for filling in and leveling on the dump, and as a snow plow.

Another 10-ton was hitched to a big 12-foot Adams' Road King Grader, and motion pictures were shown of this combination outfit at work in Bureau County, Illinois. A 5-ton was shown hitched to a Baker Maney Self-loading Scraper. The T-35, the smallest number of the "Caterpillar" line is especially designed for road dragging, patrol maintenance, industrial and road making operations of many kinds.

Numerous officials and representatives of The Holt Manufacturing Co. were in attendance during the show, including M. M. Baker, vice president. Numerous orders were placed for tractors, and other Holt products.

CLEVELAND BUILDING EXPOSITION POSTPONED

The opening of The American Building Exposition, Cleveland, has been postponed from February 22 to a date in April, probably not later than the 18, to correspond with the delayed completion of the new city auditorium before it is formally accepted by the city and offered for exhibition purposes. This is the second postponement that has been forced upon the Exposition management through failure to have the building finished upon schedule time. Originally it was scheduled to open on January 4. The largest of the individual exhibits will represent an outlay of approximately $25,000.

The Exposition, sponsored by The Builders' Exchange, is being put on upon a co-operative, non-profit basis, the net profits to be rebated pro rata to the exhibitors, the sole object being to stimulate building interest in the Cleveland district.

PERSONALS

Ure, F. J., town engineer of Woodstock, Ont., has been appointed engineer and surveyor for East Zorra township.

Ferris, W. H., has been appointed chairman of the highway committee of the Essex County Council, Ont.

Sutherland, Dr. W. H., has been appointed Minister of Public Works for British Columbia.

Young, Samuel, has been appointed chief engineer of the Board of Commissioners of the Port of New Orleans, La.

Starr, Rex C., has been named chief engineer for the Merced Irrigation District.

Ragland, R. F., formerly assistant engineer in charge of road maintenance and construction in Yellowstone National Park, is now connected with the state highway commission of Montana.

Bestor, O. B., has been appointed principal locating engineer for the North Carolina State Highway Commission.

Wiggin, Thomas H., formerly principal designing engineer of the Catskill aqueduct for the Board of Water Supply of New York City, has opened an office in New York City for the practice of engineering.

Lackey, O. B., has been made city manager of Morganton, N. C.

Frost, Harry, superintendent of the waterworks department of Akron, Ohio, died on January 27th.

Tewksbury, E. A., has been appointed acting city engineer of Cuyahoga Falls, Ohio.

Campbell, P. F., was elected borough engineer of Lilly, Pa., at a recent meeting of the council.

Kennedy, John P., has been appointed a member of the board of public utilities of Los Angeles, Cal.

Fitzpatrick, Patrick H., has been appointed superintendent of streets for the city of Bridgeport, Conn., for a term of two years.

Hinkle, Henry Gordon, for four years city manager of Altoona, Pa., has been appointed city manager and chief engineer of Columbus, Ga.

Borden, George W., acting chief since the resignation of C. C. Cottrell last September, has been made chief engineer of the department of highways for the state of Nevada.

Bailey, A. R., has been appointed engineer manager of the Washtenau County, Mich., road commission, to succeed John J. Cox, resigned.

Wheatley, Charles, of the Georgia state highway department, has been made city engineer of Americus, Ga.

LaFleur, Eugene D., chief engineer of the Canadian department of public works, died suddenly at his home at Ottawa.